Revision checklist – Cell Biology GCSE Trilogy Biology

Use this checklist to highlight your confidence and revision preparedness for upcoming exams. R – None. A – Some. G – Ready!

An electronic version can be available to you if required.

Specification	Statement	Additional details	R	A	G
4.1.1.1 Eukaryotes and prokaryotes	I can identify and remember the structures in plant and animal cells (eukaryotes)	Cell membrane			
		Cytoplasm			
		Genetic material in a nucleus			
	I can identify and remember the structures in a bacterial cell (prokaryotes)	Cytoplasm			
		Cell membrane			
		Cell wall			
		Genetic material not in a nucleus – single DNA loop			
		One or more small rings of DNA - plasmids			
	I know that bacteria are much smaller than animal and plant cells				
	I understand that images can be drawn with different orders of magnification	An image that has a larger magnification has an actual size that is smaller than a lower magnification if the image is the same size			
4.1.1.2 Animal and plant cells	I can identify and explain the main sub-cellular structures of a eukaryotic cell	Nucleus			
		Cytoplasm			
		Cell membrane			
		Mitochondria			
		Ribosomes			
	I can identify the additional parts found in plant cells	Chloroplasts			
		Permanent vacuole filled with cell sap			
	I know that a cell wall is made of cellulose				
	I know that cellulose strengthens the cell in plant and algal cells				
	I can recognise images of cells				
	I can draw images of cells				
	I can interpret images of cells				
	I can estimate relative size or area of subcellular structures using videos, bio-viewers, photographs and micrographs				
4.1.1.3 Cell specialisation	I can explain how the structure of different types of cell relate to their function in animals	Sperm cell			
		Nerve cell			
		Muscle cell			
	I can explain how the structure of different types of cell relate to their function in plants	Root hair cell			
		Xylem vessel			
		Phloem vessel			
4.1.1.4 Cell differentiation	I can explain the importance of cell differentiation				
	I know that most types of animal cell differentiate at an early age	Embryo			
	I know that many types of plant cell retain the ability to differentiate throughout life	Meristem			
	I understand that in mature animals, cell division is mainly restricted to repair and replace cells	E.g. by mitosis			
	I understand that as a cell differentiates, it acquires different numbers of sub-cellular structures to carry out a specific function.	E.g. A white blood cell requires more ribosomes to make antibodies (proteins)			
		The cell becomes a specialised cell.			
4.1.1.5 Microscopy	I understand how microscopy techniques have developed over time	Light microscope uses light with lenses Electron microscope uses electrons with electromagnets			
	I can explain how electron microscopes have increased understanding of sub-cellular structures				
	I can describe the term magnification				
	I can describe the term resolution				
	I know that an electron microscope has a much higher resolution and resolving power than a light microscope	Therefore cells can be studied in more detail			

4.1.2.1 Cell division - chromosomes	I know that the nucleus of a cell contains chromosomes made of DNA molecules				
	I understand that a chromosome carries a large number of genes	Genes code for specific proteins for specific characteristics			
	I know that most cells contain chromosomes normally found in pairs				
	I can use models and analogies to explain how cells divide				
4.1.2.2 Mitosis and the cell cycle	I know that cells divide in a series of stages called the cell cycle.				
	I can describe the stages of the cell cycle	A cell grows and increases the number of sub-cellular structures such as ribosomes and mitochondria			
		The DNA replicates to form two copies of each chromosome			
		During mitosis, one set of chromosomes is pulled to each end of the cell			
		At the end of mitosis, the nucleus divides and the cytoplasm and cell membranes divide			
	I can describe how the formation of two genetically identical daughter cells occurs in mitosis				
	I can describe how cell division by mitosis is important for growth and development of multicellular organisms				
	I can recognise and describe situations where mitosis is occurring	E.g. asexual reproduction			
4.1.2.3 Stem cells	I can describe what a stem cell is	Undifferentiated cell			
		Capable of giving rise to many more (stem) cells			
		Can differentiate / specialise into different types of cell			

	I can describe the function of stem cells:	In an embryo			
		In adult animals			
		In the plant meristem			
	I know that stem cells from human embryos can be cloned and made to differentiate into most types of human cells	Including blood cells			
	I can describe how meristem tissue in plants can differentiate into any type of plant cell	At any stage of development			
	I can explain why stem cells from adult bone marrow are restricted on the types of cell they can be specialised into	E.g. for blood			
	I can describe different treatment options for the use of stem cells for medical requirements	Therapeutic cloning			
		Diabetes treatment			
		Paralysis treatment			
	I can describe how therapeutic cloning of an embryo has the same genes as the parent.				
	I understand that if cells are not genetically the same, they are rejected by the patient's body and so can make that person ill	If cells are not rejected, they may be useful for medical treatment			
	I can evaluate the risks of stem cell treatments	E.g. Transfer of viral infections			
		Ethical objections			
		Religious objections			
	I know that stem cells in plants are used to produce clones of plants	Quickly and economically			
	I can describe the benefits of growing plants from meristem cells	E.g. rare species can be cloned to protect from extinction			
		E.g. Crop plants with disease resistant genes can be cloned to produce large numbers of identical plants for farmers			
	I can evaluate the practical risks and benefits, as well as social and ethical issues of the use of stem cells in medical research and treatments				

4.1.3.1 Diffusion	I can describe how substances move in and out of cells by diffusion	Across cell membranes			
	I can define diffusion	Spreading out of particles of any substance in a solution or gas			
		The net movement from an area of high concentration			
		To an area of lower concentration			
	I can describe biological examples of diffusion	Gas exchange in lungs			
		Urea waste product from blood → kidney			
	I can explain how different factors effect the rate of diffusion	Concentration gradient			
		Temperature			
		Surface area of the membrane			
	I understand that a single-celled organism has a large surface area to volume ratio	*Compared to a larger object*			
	I can describe the importance of having a large surface area to volume ratio	To meet the needs of the organism			
	I can justify why isotonic and high energy drinks are used in sport	Diffusion			
		Osmosis			
	I can explain the need for exchange surfaces and transport systems in multicellular organisms	In terms of surface area: volume ratio			
	I can identify specialised characteristics of an exchange surface	Large surface area			
		Membrane that is thin, short diffusion pathway			
		(Animals) sufficient blood supply			
		(Animals) ventilation			
	I can describe the adaptations of exchange surfaces	Small intestine (mammals)			
		Lungs (mammals)			
		Gills in fish			
		Roots in plants			
		Leaves in plants			
	I can describe the importance of exchange surfaces to have sufficient molecules transported into and out of cells				

4.1.3.2 Osmosis	I know that water may move across a cell membrane via osmosis.				
	I can define osmosis	Diffusion of water			
		From a dilute solution			
		To a concentrated solution			
		Through a partially permeable membrane			
	I can describe a dilute solution				
	I can describe a concentrated solution				
	I can recognise a partially permeable membrane	Given a model / diagram of a practical set up			
4.1.3.3 Active Transport	I can define the process of active transport				
	I can describe how particles move by active transport across a membrane				
	I know that active transport requires energy				
	I know that energy is provided from respiration	Aerobic or anaerobic (in animals)			
	I can describe how mineral ions are absorbed into the plant root hairs	From dilute solutions in the soil			
	I can explain how the active transport of mineral ions leads to the osmosis of water in root hair cells				
	I know that plants require ions from the soil for healthy growth				
	I can describe how sugar is absorbed when in low concentrations in the gut than in the blood (higher)				
	I know that sugar molecules are used for respiration	E.g. Glucose			
	I can describe how substances are transported into and out of cells by diffusion, osmosis and active transport				
	I can explain the differences between diffusion, osmosis and active transport				

Practical skills	I know about - Required Practical 1 – Using a light microscope to observe, draw and label a selection of plant and animal cells.				
	I can recognise diagrams that model diffusion				
	I can draw diagrams that model diffusion				
	I can justify why diagrams are modelling diffusion				
	I know about Required Practical 2 – Investigating a range of concentrations of salt or sugar solutions on the mass of plant tissue	E.g. Calculating percentage mass change due to osmosis			
Mathematical skills	I can calculate magnification	Magnification = Image size / Actual size			
	I can measure the length of an image using a ruler in mm				
	I can write in standard form				
	I can make order of magnitude calculations	Converting between different scales of number			
	I recognise and can use and convert numbers	Centi… c			
		Milli… m			
		Micro… μ			
		Nano… n			
	I can calculate the surface area of a cube				
	I can calculate the volume of a cube				
	I can calculate the area of a circle				
	I can substitute the values required to calculate the surface area of a given shape				
	I can substitute the values required to calculate the volume of a given shape				
	I can calculate the surface area: volume ratio of a 3D structure				
	I can compare surface area: volume ratios for different structures				
	I can use simple compound measures of rate of water uptake				
	I can use percentages				

	I can calculate percentage gain and loss of mass of plant tissue				
	I can plot and draw graphs	E.g. percentage mass change given different concentrations of a solution			
	I can interpret graphs	E.g. observing rate of osmosis			

Revision checklist – Organisation GCSE Trilogy Biology

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Specification	Statement	Additional details	R	A	G
4.2.1 Principles of organisation	I know that a cell is a basic building block of all living organisms	E.g. white blood cell			
	I know that a tissue is a group of cells with a similar structure and function	E.g. External skin surface			
	I can state that an organ is an aggregation of tissues	E.g. Stomach			
	I know that organs are organised into organ systems which work together to form organisms	E.g. Digestive system or nervous system for a human			
4.2.2.1 Animal tissues, organs and systems – the human digestive system	I know that the digestive system is an example of an organ system in which several organs work together to digest and absorb food.				
	I can identify the digestive system organs and their role in digestion	Mouth (teeth, salivary glands)			
		Oesophagus			
		Stomach			
		Liver			
		Gall bladder			
		Pancreas			
		Small intestine (ileum)			
		Large intestine (colon, rectum, anus)			
	I can link my knowledge of enzymes to metabolism	The rate for which all chemical reactions in a cell or organism occur.			
	I can describe the nature of enzyme molecules and relate their activity to changes in the direct environment	Temperature			
	I can link my knowledge of enzymes to metabolism	pH			
	I understand that enzymes catalyse specific reactions in living organisms	This is due to the shape of the active site			
	I know what the active site is of an enzyme	The location where a specific substrate can bind to the enzyme, on the enzyme			
	I can describe and use the 'lock and key' theory of fit as a simplified model to explain enzyme action				
	I can recall the enzymes used for digesting large food molecules	Amylase for starch			
	I can describe and use the 'lock and key' theory of fit as a simplified model to explain enzyme action	Proteases for proteins			
	I can recall the enzymes used for digesting large food molecules	Lipases for lipids / fats / oils			
	I can recall the sites of production and the action of enzymes	Amylase – salivary glands, pancreas, small intestine			
		Proteases – stomach, pancreas, small intestine			
	I can recall the sites of production and the action of enzymes	Lipases – pancreas, small intestine			
		Starch → (amylase) → Simple sugars			
	I can write word equations for the substrates, enzymes and products of digestion	Proteins → (proteases) → Amino acids			
	I can write word equations for the substrates, enzymes and products of digestion	Lipids → (lipase) → Fatty acids (3) and glycerol (1)			
	I can describe the importance of digestive enzymes / digestion	Convert food into small, soluble molecules that can be absorbed into the bloodstream			
	I can describe the importance of digestion				
	I know that amylase is an example of a carbohydrase enzyme				
	I know what the products of digestion are used for	To build new carbohydrates eg glycogen			
	I know that amylase is an example of a carbohydrase enzyme	To build lipids eg triglycerides			

	I know what the products of digestion are used for	To build proteins eg in muscle cells			
		To release energy for cell processes			
	I can describe the importance for glucose being used for respiration I know where bile is produced	Liver			
	I know where bile is stored until use	Gall bladder			
	I know that bile is an alkaline solution	Neutralise hydrochloric acid from the stomach			
		Emulsifies fat forming small droplets			
	I know that a small droplet of fat has a larger surface area to volume ratio compared to a larger droplet				
	I know that the alkaline conditions and large surface area increases the rate of fat breakdown by lipase.	Due to the presence of bile			
4.2.2.2 The heart and blood vessels	I can identify structures of the human heart	Left atrium			
		Left ventricle			
		Aorta			
		Vena Cava			
		Right atrium			
		Right ventricle			
		Pulmonary artery			
		Pulmonary vein			
	I can identify the structures of the human lung	Trachea			
		Bronchi / bronchus			
		Bronchioles			
		Alveoli			
		Capillary network (adjacent to alveoli)			
	I can describe how lungs are adapted for gas exchange				
	I know that the heart is an organ that pumps blood around the body				

	I know that the body has a double circulatory system	Heart → lungs → Heart → body → …			
	I know that the right ventricle pumps blood to the lungs				
	I know the left ventricle pumps blood around the rest of the body				
	I know that the coronary arteries provide the heart organ with oxygen				
	I know that the heart contains valves to maintain blood flow in one direction				
	I can identify where the group of cells forming a natural pacemaker are in the heart	Right atrium			
	I can describe the importance of an artificial pacemaker	Correct irregularities in the heart rate			
	I can describe what an artificial pacemaker looks like				
	I know the structure of the three types of blood vessel in the body	Arteries			
		Capillaries			
		Veins			
	I can describe how the structure of each blood vessel relates to its function.				
4.2.2.3 Blood	I can describe blood as a tissue	Plasma			
		Red blood cells			
		White blood cells			
		Platelets			
	I can describe the function of each part of blood	Plasma			
		Red blood cells			
		White blood cells			
		Platelets			
	I can recognise different types of blood cell in a photograph / diagram	Red blood cells			
		White blood cells			

	I can explain how blood cells are adapted to their functions	Red blood cells			
		White blood cells			
4.2.2.4 coronary heart disease: a non-communicable disease	I can evaluate the advantages and disadvantages of treating cardiovascular diseases	Drugs e.g., statins			
		Mechanical devices e.g., valves, stents			
		Transplants			
	I can describe the medical diagnosis of coronary heart disease	Layers of fatty material build up inside the coronary arteries, narrowing them			
		Blood flow is restricted through the arteries			
		A lack of oxygen is available for the heart muscle			
	I can justify why a stent is used for coronary heart disease				
	I can describe the effect of statins to reduce blood cholesterol	To slow down the rate of fatty material deposit			
	I can describe when heart valves become faulty, they prevent the valve from opening fully	Heart valve may leak			
	I can identify that replacement valves can be biological or mechanical				
	I know that if a person has heart failure, a donor heart can be transplanted	Or heart and lungs			
	I can describe when the use of an artificial heart is required	Waiting for a transplant			
		Rest during recovery for the heart			
	I can evaluate methods of treatment for coronary heart disease	Benefits			
		Risks			
Practical skills	Required Practical 4 – Use qualitative reagents to test for a range of carbohydrates, lipids and proteins.	Benedict's test for sugars			
		Biuret reagent for protein			
		Iodine solution for starch			
	Required Practical 5 – Investigate the effect of pH on the rate of reaction of amylase enzyme	Continuous sampling technique (over time)			
		Determine the time taken to completely digest starch solution			
		Testing a range of pH (independent variable)			

		Controlling temperature using a water bath / heater			
	I can draw blood cells seen under a microscope				
	I can evaluate the risks related to working with blood products				
Mathematical skills	I can carry out rates calculations for chemical reactions				
	I can carry out rate calculations for blood flow				

Revision checklist – Infection and Response GCSE Trilogy Biology

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Specification	Statement	Additional details	R	A	G
4.2.2.5 Health issues	I can describe the relationship between health and disease				
	I know that health is the state of physical and mental well-being				
	I know that diseases are major causes of ill health	Communicable (contagious)			
		Non-communicable (developed over time)			
	Lifestyle factors have a profound effect on physical and mental health	Diet			
		Stress			
		Life situation (e.g., poverty / low income)			
	Different types of disease can vary their interaction	E.g., immune system defects and the risk of suffering from infectious diseases			
		E.g., viruses can trigger cancers			
		E.g., immune reactions from pathogens can trigger allergies			
		E.g., severe physical ill health can lead to depression and other mental illness			
4.2.2.6 The effect of lifestyle on some non-communicable diseases	I can discuss the human and financial cost of these non-communicable diseases to groups of people	Individual			
		Local community			
		Nation			
		Globally			
	I can explain the effect of lifestyle factors on the incidence of non-communicable diseases	Diet			
		Alcohol			
		Smoking			
	I know that a person is more likely to suffer from a disease if they are exposed to risk factors	Aspects of a person's lifestyle			
		Substances in the person's body / environment			
	I can define the term 'causal mechanism'				
	I can identify causal mechanisms proven in medical settings	Diet, smoking and exercise on cardiovascular disease			
		Obesity and Type 2 diabetes			
		Alcohol on liver and brain function			
		Smoking on lung disease/cancer			
		Smoking and alcohol on unborn babies			
		Carcinogens (e.g., ionising radiation) and cancer			
4.2.2.7 Cancer	I know that cancer is a result of changes in cell's DNA	Uncontrolled rate of growth and cell division			
	I can describe what a benign tumour is	Growth of abnormal cells			
		Usually within a membrane			
		Do not invade other parts of the body / specialised cells			
	I can describe what a malignant tumour is	Cancers			
		Invade neighbouring tissues			
		Spread to different parts of the body via blood			
		Form secondary tumours away from the original			
	I can identify lifestyle risk factors for various types of cancer	E.g., smoking and lung cancer			
	I know that there are genetic risk factors for some cancers	E.g., inheriting the cancerous gene from a parent for bowel cancer			
4.3.1.1 Communicable (infectious) disease	I can explain how diseases are caused by pathogens	Viruses			
		Bacteria			
		Protists			
		Fungi			
	I know that animals and plants can suffer from communicable diseases				
	I can describe how diseases spread	E.g., air, water, direct contact			
	I can identify how to reduce/prevent the spread of disease				
	I know that pathogens are disease causing microorganisms	Infectious disease			
	I know that bacteria and viruses may reproduce rapidly inside the body				
	I know that bacteria can produce poisons (toxins) that effect a person's health	Damage tissues			
		Make the person/organism feel ill			

	I know that viruses live and reproduce inside cells	Causing cell damage			
4.3.1.2 Viral diseases	I can describe the symptoms of measles	Fever			
		Red skin rash			
	I know that measles is a serious illness	Fatal if complications arise			
	I know that most young children are vaccinated against measles.				
	I know that measles spreads by inhalation of droplets	Sneezes and coughs			
	I can describe what HIV is	Human Immunodeficiency Virus			
	I can describe the symptoms a person will first experience with HIV	Flu-like symptoms			
	I know that antiretroviral drugs control the virus in an infected person				
	I know that the HIV virus targets / attacks the body's immune cells				
	I know that AIDS happens later in the development of the condition	Acquired Immunodeficiency			
		Body's immune system too damaged			
		Can no longer respond to other infections or cancers			
	I know that HIV is spread through exchange of body fluids	Blood – e.g., sharing needles between drug users			
		Sexual contact			
	I know that TMV is a disease in plants	Tobacco Mosaic Virus			
		E.g., affects tomatoes			
	I can identify the symptom of TMV	Mosaic pattern			
		Discoloration of leaves			
	I can describe the effect of TMV on plant growth	Stunted			
	I can explain the effect of TMV on plant growth	Lack of photosynthesis			
		Lack of glucose production for energy provision for growth from respiration			
4.3.1.3 Bacterial diseases	I know that *Salmonella* is a bacteria that causes food poisoning				
	I know that *Salmonella* is spread by being ingested	Prepared in unhygienic conditions			

	I can describe the symptoms of food poisoning are because of the toxins secreted	Fever (high temperature)			
		Abdominal cramps			
		Vomiting			
		Diarrhoea			
	I can describe how gonorrhoea is spread	Sexually transmitted disease (STD)			
	I can describe the symptoms of gonorrhoea	Thick yellow/green discharge from vagina or penis			
		Pain when urinating			
	I know gonorrhoea is a bacterium				
	I know that bacterial infections are treated with antibiotic medication				
	I know that the overuse of antibiotics can lead to resistant strains appearing				
	I can describe ways that the spread of gonorrhoea can be controlled	Barrier methods of contraception e.g., condom			
4.3.1.4 Fungal diseases	I know that Rose black spot is a fungal disease	Affects plants e.g., roses			
	I can describe the symptoms of rose black spot, on roses	Black spots develop on leaves			
		Leaves eventually turn yellow			
		Leaves drop (early)			
	I can describe the effect of rose black spot on the growth of the plant	Photosynthesis is reduced			
		E.g., Lack of glucose available for respiration to release energy for cell division / growth			
	I know that rose black spot is a communicable disease	Wind			
		Water			
	I know how a plant with rose black spot can be treated	Fungicide to kill fungus (pathogen)			
		Removing/destroying the affected leaves			
4.3.1.5 Protist diseases	I can identify a protist disease	Malaria			
	I can describe the life cycle of malaria to include the mosquito	(Specific species of mosquito)			
	I can describe symptoms of malaria	Recurrent episodes of fever			
		Fatal			
	I can describe how the spread of malaria can be controlled	Prevent vectors (e.g., mosquitos) from breeding			
		Using mosquito repellent / nets to avoid being bitten			

4.3.1.6 Human defence systems	I can describe the non-specific defence systems of the human body against pathogens	Skin			
		Nose			
		Trachea and bronchi			
		Stomach			
	I can explain the role of the immune system in the defence against disease	If a pathogen enters the body, the immune system tries to destroy the pathogen			
	I can describe how white blood cells help defend against pathogens	Phagocytosis (engulf)			
		Production of antibodies (isolate pathogens)			
		Production of antitoxins (neutralise toxins)			
4.3.1.7 Vaccination	I can explain how vaccinations prevent illnesses to an individual				
	I can describe how the spread of pathogens is reduced by immunising large proportions of the population				
	I can describe the process of vaccination	Introducing small quantities of the pathogen			
		Dead / inactive pathogen			
		White blood cells stimulate production of antibodies			
		The same pathogen re-enters the body (later)			
		White blood cell response is quicker to produce specific antibodies			
		Prevent infection			
	I can evaluate the global use of vaccination in the prevention of spread of disease	Advantages			
		Disadvantages			
]4.3.1.8 Antibiotics and painkillers	I can explain the use of antibiotics in treating disease	Bacterial disease only			
		Cannot kill viruses / viral diseases			
	I can explain the use of medicines in treating disease				
	I know that antibiotics include penicillin				
	I know that antibiotics are used to cure bacterial disease	Kill ineffective bacteria inside the body			
	I know the importance of treating specific bacteria with specific antibiotics				

	I know that the use of antibiotics has greatly reduced deaths from infectious bacterial diseases				
	I know that there are several reasons why antibiotic resistance occurs				
	I know that painkillers/ other medications treat symptoms of the disease	Painkillers do not kill pathogens			
	I know that it is difficult to develop drugs that kill viruses	These drugs also damage body tissues as well			
4.3.1.9 Discovery and development of drugs	I can describe the process of the discovery of potential new drugs	Extraction from plants			
		Extraction from microorganisms			
	I can identify where drugs have been extracted from	Heart drug - digitalis - foxgloves			
		Painkiller – aspirin – willow			
		Penicillin – antibiotic - *Penicillium mould*			
	I know that Alexander Fleming discovered penicillin	By accident!			
	I know that most new drugs are synthesised by chemicals in the pharmaceutical industry.	Starting point may still be a chemical extracted from a plant			
	I know that new medical drugs have to be tested and trialled before being used	Safety (toxicity)			
		Efficacy (effectiveness)			
		Dose (advised quantity to take)			
	I can describe the process of the development of potential new drugs in drug trials	Pre-clinical testing			
		Clinical trials			
	I know what occurs during pre-clinical trials	In a laboratory			
		Using cells, tissues, live animals			
	I can describe the importance of the procedures in clinical trials	Healthy volunteers			
		Patients (unwell volunteers)			
		Starting with very low doses of the drug at start of trial			
		Safety confirmed, further clinical trials with various volunteers to find optimum dose			
		Double blind trials			
		Placebo use			
		Peer review after scrutiny and publishing			

		Drug ready for sale / commercial use			
Practical skills	I understand sampling principles applied to scientific data	Epidemiological data			
		Risk factors			
Mathematical skills	I can calculate the number of bacteria in a population after a certain time	Given the mean division time			
	I can calculate the cross-sectional area of a circle using πr^2	E.g., the size of a colony of bacteria			
		E.g., the size of the clear 'zone of inhibition'			
	I can express numbers in standard form	A x 10^B where: 0>A>10 and B can be +/-			
	I can translate disease incident information between graphs and tables	E.g., death rates, population sizes, numbers of vaccines administered			
	I can construct and interpret frequency tables and diagrams	Bar charts			
		Histogram			
	I can construct and use scatter diagrams				
	I can identify if a correlation exists between two variables in a scatter diagram	Positive			
		No correlation			
		Negative			

Revision checklist – Bioenergetics GCSE Trilogy Biology

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Specification	Statement	Additional details	R	A	G
4.2.3.1 Plant tissues	I can explain how the structures of plant tissues are related to their functions	Epidermal tissue			
		Palisade mesophyll			
		Spongy mesophyll			
		Xylem			
		Phloem			
		Guard cells around stomata			
		Meristem tissue (root and shoot tips)			
4.2.3.2 Plant organ systems	I can explain the structure of plant cells and how they are adapted to their functions.	Root hair cells			
		Xylem			
		Phloem			
	I can explain the effect of environmental factors on the rate of transpiration.	Changing temperature			
		Humidity			
		Air movement			
		Light intensity			
	I know the plant organ system for transport of substances around a plant	Including roots, stem and leaves			
	I can describe the process of transpiration				
	I can describe the process of translocation				
	I know the structure and function of stomata	Including the role of guard cells for gas exchange and water loss			
	I can define and describe how active transport and osmosis occur in root hair cells	E.g. Mineral ion absorption (active transport) E.g. Water movement (by osmosis)			
	I can describe the xylem tissue and their function for a plant	Water and ion movement from roots to stems and leaves. Hollow tubes strengthened by lignin Transpiration stream			
	I can describe the phloem tissue and their function for a plant	Moving dissolved sugars from the leaves to the entire plant for use / storage. Elongated cells. Cell sap can move from one phloem cell to another through pores in end walls.			
4.4.1.1 Photosynthetic reaction	I can identify the equation for photosynthesis	Word and symbol equations			
	I can describe what an endothermic reaction is	E.g. photosynthesis- energy transferred from the environment to chloroplasts by light			
4.4.1.2 Rate of photosynthesis	I can describe how the rate of photosynthesis can be optimised and limited by interacting factors	Temperature			
		Light intensity			
		Carbon dioxide concentration			
		Amount of chlorophyll			
	I can describe how limiting factors are important in the economics of greenhouse conditions **HT**	Maximum rate of photosynthesis vs profits			
4.4.1.3 Uses of glucose from photosynthesis	I can identify how glucose is utilised when produced after photosynthesis in a plant	Used for respiration			
		To produce fats / lipids / oil for storage			
		To produce cellulose for cell wall strengthening			
		Converted to insoluble starch for storage			
		Produce amino acids for protein synthesis			
4.4.2.1 Aerobic and anaerobic respiration	I can describe cellular respiration as an exothermic reaction	Continuous provision of energy for living processes			
	I can compare and contrast aerobic and anaerobic respiration	Oxygen use (aerobic)			
		Transferring chemical to thermal energy			
		Products of each process			
		Relative amounts of energy transferred			
	I can summarise an organisms need for energy	Including chemical reactions for building larger molecules			
		Movement			
		Keeping warm			
	I can identify the equation for aerobic respiration	Word and symbol equations			
	I can identify the equation for anaerobic respiration in muscles	Glucose → lactic acid			

	I can identify the equation for anaerobic respiration in plants and yeast cells	Glucose → ethanol + carbon dioxide			
	I can describe the importance of fermentation in yeast cells	Manufacture of bread and alcoholic drinks			
4.4.2.2 Response to exercise	I can describe the need for increased oxygen and glucose for the energy demands for exercise	Heart rate			
		Breathing rate			
		Breathing volume			
	I can describe how investigations into the effect of exercise on the body happen				
	I can describe the consequence of the lack of oxygen on muscles.	Lactic acid builds up Oxygen debt Fatigued muscles (contracting inefficiently)			
	I know how lactic acid is removed towards and by the liver **HT**	Converted back to glucose			
		Repayment of oxygen debt to remove lactic acid			
4.4.2.3 Metabolism	I can explain the importance of these substrates in metabolic reactions	Sugars / carbohydrates e.g. glucose			
		Amino acids			
		Fatty acids and glycerol			
	I can define metabolism				
	I know that the energy from respiration is available for continual enzyme-controlled processes of metabolism	Conversion of glucose to starch, glycogen, and cellulose			
		Formation of lipids from glycerol and three fatty acids			
		Use of glucose and nitrate ions to form amino acids (for protein synthesis)			
		Respiration			
		Breakdown of excess proteins (amino acids) to form urea for excretion			
Practical skills	I know how to measure the rate of transpiration by the uptake of water	Using a potometer			

	I know how to investigate the distribution of stomata and guard cells				
	I know the method, typical results and conclusions from Required Practical 5	Investigating the effect of light intensity on the rate of photosynthesis using an aquatic organism such as pondweed			
	Testing for starch glucose and proteins	Reagents used to include iodine solution, Benedict's solution and Biuret reagent			
Mathematical skills	I know how to calculate a mean				
	I know how to calculate a rate	E.g. rate of transpiration from stomata			
	I understand principles of sampling	E.g. using a microscope to sample fields of view			
	I can calculate surface areas	E.g. Given the diameter of a circle or side lengths of a rectangle			
	I can calculate volumes	E.g.. The volume of a bubble or cube			
	I can translate information between graphical and numerical form				
	I can plot and draw a suitable graph selecting scales and axes values				
	I can extract and interpret information from graphs, charts, and tables	E.g. photosynthesis rate involving one / two / three limiting factor(s)			
	Measure and calculate the rate of photosynthesis				