Assessment Schedule – 2011

Biology: Describe cell structure and function (90464)

Assessment Criteria

Achievement	Achievement with Merit	Achievement with Excellence
Describe biological concepts and processes relating to cell structure and function requires the candidate to recognize, name, draw, give characteristics of or an account of biological concepts and processes relating to cell structure and function.	*Explain biological concepts and processes relating to cell structure and function requires the candidate to provide a reason as to how or why something occurs with regards to biological concepts and processes relating to cell structure and function.*	*Discuss biological concepts and processes relating to cell structure and function requires the candidate to show understanding by linking biological ideas. It involves students in justifying, relating, evaluating, comparing and contrasting, and analyzing biological concepts and processes relating to cell structure and function .*

Evidence Statement

Q	Possible coverage	Achievement	Merit	Excellence
ONE	Describes the functions of both mitochondria (cellular respiration) and chloroplasts (photosynthesis) appropriately, giving detail of the basic processes for each one. Explains how the structures of the organelles allow them to carry out their function, referring to at least two named structures in each case. Compares and contrasts the two organelles to identify the similarities and differences in their structure, location, and number, and gives reasons for these.	Describes at least TWO ideas. **Processes** **Examples:** • Chloroplasts carry out photosynthesis which uses light energy to assemble simple molecules into glucose. • Mitochondria carry out cellular respiration, which involves the breakdown of glucose to release usable energy (ATP) **Functions of structures** **Examples:** • The cristae increase surface area for reactions to occur on • The thylakoid / grana membranes increase surface area for reactions to occur on. • The matrix allows for transport of substances required for or released from respiration • The stroma allows for transport of substances required for or released from photosynthesis. • etc (accept other correct descriptions of mitochondria or chloroplast functions of structures) **Similarities or differences described** **Examples:** • Chloroplasts are found only in plant cells while mitochondria are found	Explains at least TWO ideas. **Examples:** **Mitochondria** • Double membrane of mitochondria with the inner membrane folded into cristae to make large S.A so that the number of reactions can be increased, especially with respect to ATP production. • The matrix contains a highly-concentrated mixture of hundreds of enzymes which allows for easy transport of materials of the reactants and the products of respiration and therefore allows increased reactions to proceed in contact with the cristae. • Outer membrane is semi-permeable to allow the passage of smaller molecules from one side to the other. This ensures that reactants and products can be easily transported and used as required **Chloroplasts** • Outer membrane is almost transparent to allow the maximum amount of light to pass through. This maximises the penetration of sunlight energy and therefore enables the rate of the reaction to proceed more quickly. • Thylakoids are the sites of light absorption and ATP synthesis, and contain many proteins. Their flat, thin shape allows for maximum uptake of materials due to short diffusion distances. • The flattened disk-shape of the grana provides an increased S.A. so that so that the number of reactions that can occur is increased. • The stroma is clear, so it doesn't block light thus maxmising the penetration of light into the chloroplast providing the energy for the reaction to proceed. • Chloroplasts are only found in plant	Compares and contrasts at least ONE idea relating to chloroplasts and mitochondria using comparative language. **Example:** Like the mitochondria, the chloroplast also increases the surface area available for chemical reaction by having increased membrane space. While the mitochondria achieves this by in-foldings of the inner membrane (cristae), the chloroplasts has stacks of thylakoid membranes called grana.

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		in plant and animal cells • More mitchondria are found in muscle cells while there are less in skin cells • More chloroplasts are found in leaf cells than in plant root cells. • The chloroplast achieves increased surface area through stacks of membranes (grana). The mitochondria achieves increased surface area through infoldings of membranes (cristae).	cells (and some eukaryotic organisms). This is because they are only found in autotrophic organisms, those that can manufacture their own energy source. • Chloroplasts are usually found in the upper parts of leaves in the highest density. This maximises the ability to absorb energy from the sun • Mitochondria are in most eukaryotic cells and are found in the highest density where cellular activity is high due to increased energy requirements such as muscles and glands.	

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TWO (a)	Describes the function of organelles	Describes at least TWO statements **Examples** • Describes the function of Lysosomes as organelles that contain enzymes to break up / digest waste materials, cellular debris or food particles. • Describes the function of Golgi body to modify the newly synthesized proteins then process them and sort them for transportation **Describes SPECIFICITY** • Describes specificity in terms of temperature • Describes specificity in terms of pH • Describes specificity in terms of substrates on which enzymes work and / or the active site • Describes denaturing **RATE** • Describes the higher the substrate concentration the more likely they are to collide with the enzyme. • Describes the higher the enzyme concentration the higher the overall rate of reaction. • Describes co-enzymes are additional organic or molecules needed by many enzymes to carry out their function.	Explains at least TWO statements **Examples.** **Lysosme / Golgi** • Lysosomes are organelles that contain enzymes to break up / digest waste materials, cellular debris or food particles. Cells require lysosomes because they allow for digestion and then absorption of materials required by the cell and allows cells to remove wastes which may be toxic to the cell. • Golgi bodies modify the newly synthesized proteins then process them and sort them for transportation. Cells need golgi bodies because the protein molecules made by the ribosomes are not ready for use by the cell and may require modification before they can carry out. **Provides explanation of SPECIFICITY in terms of** • Changes in the conditions of pH OR temperature in relation to denaturing . eg Enzymes catalyse reactions at a specific temperature or optimum range of temperatures. Outside this range the enzyme will not function. If the temperature is too hot the bond holding the enzyme in shape will be broken causing a change in shape and thus the active site will no longer "fit" the substrate molecule and the reaction rate will slow. • Most enzymes only function on specific substrate(s) due to the precise nature of the active site. This is because the active site is a specific shape due to the arrangement of molecules. The shape is specific to the shape of the substrate molecule. **Provides explanation of RATE in terms of** • Temperature-as the temperature increases the number of collisions between the enzymes and the substrate molecules will increase since both are moving more quickly. This results in an increased reaction rate since more collisions means more reactions are likely to occur. • Substrate – as more molecules collide, more can combine and this will increase the rate of reaction, until the available enzyme molecules become 'saturated' and the rate of reaction levels off (may use a diagram to show this). • Enzyme – more availability of enzyme allows a greater number of reactions to take place so the overall rate of reaction increases. The actual enzyme activity does not increase (ie no change in product per unit time per unit mass of enzyme). • Co-enzyme – these organic molecules alter the shape of the active site in such a way that it can effectively combine with the substrate(s). Without them the enzymes	Links at least TWO factors to discuss their effect on the overall rate of activity in cells. **Example:** As the temperature increases, the number of collisions between the enzymes and the substrate molecules will increase since both are moving more quickly. This results in increased reaction rate. Likewise if more substrate is available there are more substrate molecules to collide with the enzymes, more can combine and this will increase the rate of reaction, until the available enzyme molecules become 'saturated' and the rate of reaction levels off. Since both these factors initially increase reaction rate the overall reaction rate in the cell will increase initially also.
(b)	Description of each type of specificity with an example eg: • Enzymes can only work in certain conditions, such as the stomach enzymes working in a low pH • Enzymes only work on specific substrate(s), such as amylase only working on starch • Explanation of why enzymes are specific in term of their structure and function. • Changes in condition such as pH, temperature etc. can change the nature of the active site, so that it will no longer 'fit' the target 'substrate' • Most enzymes only function on specific substrate(s) due to the precise nature of the molecular bond. The lock and key (may mention induced fit) nature of the active site is such that other 'non-target' molecules will not join with the enzyme and no catalytic action will be carried out.			
(c)	Description of the factors is given. Explains how / why the factors affect enzyme activity. Discusses the effect of the factors on the rate of reactions when considered together.			

		• Describes inhibitors prevent many enzymes from working properly.	will not work, or do so at a very low rate of activity. Inhibitors are usually considered poisons because they alter or block the active site to prevent the enzyme-substrate complex forming. This results in decreased reaction rate within a cell.	

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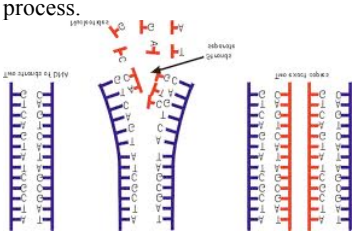
THREE	Describes DNA replication as where the DNA in a cell makes an exact copy of itself before cell division occurs, so that there is a complete set of genetic information found in each cell after division has occurred. Describes (semi-conservative) replication as where the molecule of DNA that is created contains one new strand and one old strand. May use a drawing to illustrate the process.  Explains the process of replication: • Enzymes do not have to be named, but if used, should be used correctly. • The two strands separate, exposing the bases which will act as the template. • Two new polynucleotide chains are formed using the bases of the existing strands as a complementary template. • Nucleotides join up following the base-pairing rule A-T and C-G. • After DNA replication other factors check for errors and correct them. • Discusses the rate of DNA replication which is usually higher during periods of growth and repair as more cells are being produced. During period with limited growth or replacement of cells, the amount of new DNA required is not likely to be so high. Examples should be given. Eg, during the early development in animals. Eg, following the breaking of dormancy and during seasonal growth in plants. Eg, following damage to the organism when tissue repair or replacement is necessary.	Describes at least TWO statements. **Examples** • Describes the purpose of DNA replication. • Describes replication as one old and one new strand of DNA being present in each copy of DNA. • Uses simple annotated diagram(s) OR appropriate descriptions to describe the process of DNA replication. • Gives an appropriate description of the process of DNA replication. • Describes varying rates of DNA replication	Explains at least TWO statements. **Explains the process / purpose of replication** **Examples** • The two strands separate, exposing the bases that will act as the template. This ensures that the code is correctly copied.. • Two new polynucleotide chains are formed using the bases of the existing strands as a complementary template. This ensures that each new cell gets an exact copy of the DNA information. • Nucleotides join up following the base-pairing rule A-T and C-G. This ensures that the copying is accurate and the new molecule can become complete. • After DNA replication other factors check for errors and correct them. This acts as an extra check to correct any possible errors and ensures added accuracy. **Explains why DNA replication rate varies during an organisms lifetime**. **Examples** • The new DNA is required prior to the formation of new cells. This is because each new cell requires a full set of genetic information. • Replication rate is usually higher during periods of growth and repair: Eg, during the early development in animals. Eg, during seasonal growth in plants. Eg, following damage to the organism when tissue repair or replacement is necessary.	Discusses by linking the purpose and / or the process of DNA replication to reasons why the rate of DNA replication varies throughout the lifetime of an organism.

Judgement Statement

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2 **A**	2 **M**	2 **E**