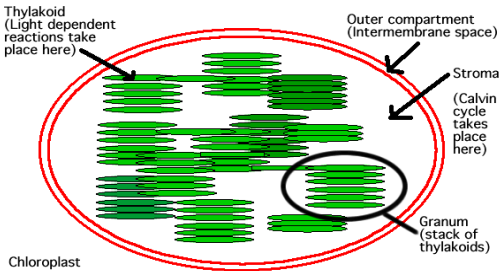


Assessment Schedule – 2012

Biology: Demonstrate understanding of life processes at the cellular level (91156)

Evidence Statement

QUESTION ONE

Evidence (<i>note this is not a model answer but a list of possible ideas</i>)	Achievement	Merit	Excellence
<p>Photosynthesis is the process in which plants use sunlight to produce sugar which is food for the plant. This is converted and stored as starch. May say converts solar energy into chemical potential energy, which is then available to other organisms.</p> <p>Basically, the plant takes 12 molecules of water and 6 molecules of carbon dioxide and converts them into one molecule of sugar, 6 molecules of oxygen and 6 molecules of water.</p> $6\text{CO}_2 + 12 \text{ (or 6) H}_2\text{O} \xrightarrow{\text{light}} \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 + 6 \text{ (or not) H}_2\text{O}^* \quad \text{chlorophyll}$ <p>* Candidates might not include water as a product, but should still get full credit.</p>  <p>www.jcc.net/~pdeccl</p> <p>The chloroplast is the organelle where photosynthesis occurs. Chloroplasts have thin membranes / large surface area for absorption of light.</p> <p>The organelle is surrounded by a double membrane. Inside the inner membrane is a complex mix of enzymes and water. This is called stroma and is important as the site of the light-independent reactions.</p> <p>Embedded in the stroma is a complex network of stacked sacs. Each stack is called a granum and each of the flattened sacs that make up the granum is called a thylakoid. The large surface area created by this arrangement, allows the maximum amount of light to be captured, and allows the enzymes that control the reaction to have the best opportunity to reach the reactants and maximise the rate of reaction.</p>	<ul style="list-style-type: none"> • Gives the purpose of photosynthesis. • Gives the reactants and products of photosynthesis / equation. (#s not required) • Gives the structure of a chloroplast. • Describes the variation of light intensity or temp or daylength with season or time of day. • Describes the structure of the chloroplast in relation to the process of photosynthesis. • Describes the role of enzymes in P/S. • Describes the distribution of chloroplasts in the cell or the plant to maximise P/S • Describes the process of P/S • Describes light and dark phases • Describes effect of change in light intensity (or other factor) on the rate of P/S. 	<ul style="list-style-type: none"> • Explains how the structure of the chloroplast is related to the process of photosynthesis. • Explains how the distribution/number of chloroplasts affects the rate of photosynthesis. • Explains how the temperature or light intensity or seasons affect the rate of photosynthesis. • Explains how adaptations of the leaf increase P/S rate. • Explains how enzymes influence the rate of P/S • Explains why spring and summer are seasons of growth • Description exemplified/ explained through the use of detailed examples • Explains how factors may affect rate of light and dark phases 	<ul style="list-style-type: none"> • Through discussion, links the rate of photosynthesis to the location of the majority of chloroplasts in the plant in relation to absorption of sunlight energy. • Discusses how the time of day / season can influence the temperature and light intensity, and how these in turn affect the rate of photosynthesis. • Discusses how change in factors affects the enzyme structure in turn affect rate of P/S. • Through discussion links the rate of cell division and increased growth with increased P/S rate due to increased light intensity in spring/ summer • Through discussion links biochemistry (cellular level) to organelle structure to rate of P/S.

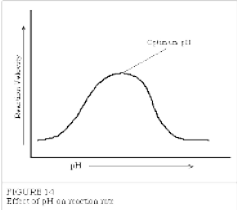
<p>The rate of photosynthesis is affected by light: Generally the more light there is, the more photosynthesis occurs. This is true up to a point, where the plant has reached maximum photosynthesis levels, and so any increase in light intensity will not affect the plant further. ie. Greater rate of photosynthesis at midday than early morning or evening, and little or no photosynthesis at night</p> <p>Also greater rate in summer compared to winter.</p> <p>Temperature affects the rate of photosynthesis. Because reactions are enzyme controlled, photosynthesis has an optimum temperature.</p> <p>Cells containing most chloroplasts are found near the top of the leaf in (palisade) long cylindrical cells, with the chloroplasts close to the walls of the cell. These factors combine and lead to more light being received where it can be used to maximise the rate of photosynthesis.</p> <p>The slight separation of the cells provides maximum absorption of carbon dioxide.</p> <p>Beneath the palisade layer is the spongy mesophyll. The cells of the spongy layer are more rounded and not so tightly packed. There are large intercellular air spaces. This maximises the rate of diffusion of the gases during photosynthesis. (CO₂ entering the leaf and O₂ leaving it.)</p> <p>Specialised guard cells, mainly on the lower leaf epidermis, function to control the movement of gases and water loss.</p> <p>The combination of the cell and organelle structure and location collectively helps to keep photosynthesis at its maximum potential rate.</p>								
N 0	N1	N2	A3	A4	M5	M6	E7	E8
No response or does not address the question.	An attempt but failure to give description or show understanding.	Provides ONE or TWO statements from Achievement.	Provides THREE statements from Achievement.	Provides FOUR statements from Achievement.	Provides TWO statement from Merit.	Provides THREE statements from Merit.	Provides TWO statement from Excellence.	Provides THREE statements from Excellence.

QUESTION TWO

Evidence (<i>note this is not a model answer but a list of possible ideas</i>)	Achievement	Merit	Excellence
<p>Diffusion:</p> <ul style="list-style-type: none"> • Movement of substances from a high concentration to a low concentration. • Diffusion takes place along a concentration gradient. • A concentration gradient exists until the diffused substance is evenly distributed. • Passive movement. <p>Eg:</p> <ul style="list-style-type: none"> • oxygen diffusing out of leaves through the stomata • carbon dioxide diffusing into a leaf through the stomata. <p>Osmosis:</p> <ul style="list-style-type: none"> • Movement of water from a high concentration of water to a low concentration of water through a semi-permeable (selectively permeable) membrane (diffusion from a more dilute solution to a more concentrated solution). • Passive movement. <p>Eg.</p> <ul style="list-style-type: none"> • absorption of water by plants through the plant roots • reabsorption of water by the proximal and distal convoluted tubules of the nephron. <p>Active transport:</p> <ul style="list-style-type: none"> • Movement from a low concentration to a high concentration (or an increase in movement rate above that which occurs without energy input from the organism) . • Energy is required. <p>Eg:</p> <ul style="list-style-type: none"> • absorption of minerals (Mg) by plant roots • uptake of glucose in intestines of humans. 	<ul style="list-style-type: none"> • Describes the processes: diffusion osmosis active transport (Must describe at least one process correctly to get to A, each correct description is a separate achieved point, up to maximum of 3 achieved points.) • Gives a described example. • Describes the meaning of a concentration gradient <p>Describes the difference between active and passive transport</p> <ul style="list-style-type: none"> • Describes the similarities or differences between 2 or more processes 	<ul style="list-style-type: none"> • Explains TWO processes: diffusion osmosis active transport (counts for 1 merit point only) OR Explains ONE process in-depth with a relevant example. (counts for 1 Merit point only) <p>and one or two of:</p> <ul style="list-style-type: none"> • Explains the affect of SA/V ratio on the rate of the process • Explains concentration gradient • Explains the similarities/differences between 2 processes • Explains an(other) example 	<ul style="list-style-type: none"> • Through discussion compares the processes and links the ideas to show when, how where the processes occur. • Response supported with detailed examples.

N0	N1	N2	A3	A4	M5	M6	E7	E8
No response or does not address the question.	Attempt the question but response inaccurate.	Provides any ONE or TWO statements from Achievement.	Provides any THREE statements from Achievement (must include at least one correct description of a process).	Provides FOUR statements from Achievement (must include at least one correct description of a process).	Provides THREE statements from Merit (must include first bullet point).	Provides THREE statements from Merit supported with at least one explained example (must include first bullet point).	Compares TWO processes fully supported with explained examples.	Compares all THREE processes supported with explained examples.

QUESTION THREE

Evidence (<i>note this is not a model answer but a list of possible ideas</i>)	Achievement	Merit	Excellence
<p>Enzymes are biological catalysts that speed up the rate of reactions or allow reactions to take place in conditions where it would not otherwise be possible.</p> <p>Enzymes function in specific conditions. Outside of these conditions the enzymes will not function as well.</p> <p>Enzymes are proteins.</p> <p>All enzymes have an optimum temperature. At very low temperatures the enzyme action is slow and at high temperatures the enzyme may become denatured which makes them inactive.</p> <p>Enzymes have an optimal pH.</p>  <p>© 2012 Worthington Biochemical Corporation. 730 Vassar Ave., Lakewood, NJ 08701 1.800.445.9603 • 1.732.942.1660</p> <p>DNA replication would occur at the greatest rate at the optimal pH.</p> <p>Co-enzymes complete the active site and are therefore essential to enzyme action.</p> <p>Poisons combine with the active site and prevent the enzyme functioning.</p> <p>Substrate is the molecule on which an enzyme acts. The concentration of this will affect enzyme action – increase in substrate results in an increase in rate of reaction up to a maximum.</p> <p>Enzymes are involved in each step of DNA replication and therefore the rate of DNA replication is dependent on the factors affecting enzyme action.</p>	<ul style="list-style-type: none"> • Describes what enzymes are. • Describes that enzymes function in specific conditions. • Describes how any TWO of these factors influence enzyme action. • Describes how enzymes function eg induced fit. • Describes the role of enzymes in DNA replication. • Describes the purpose of cell division. • Describes the process of DNA replication. <p><i>Names of specific enzymes not required (see std EN 4)</i></p>	<ul style="list-style-type: none"> • Explains how factors affect enzyme action. (up to 2 points for M) • Explains the role of enzymes in DNA replication. • Explains the process of DNA replication. <p><i>Names of specific enzymes not required (see std EN 4).</i></p>	<ul style="list-style-type: none"> • Through discussion links enzyme action to DNA replication. Discussion includes how factor(s) affect enzyme action, and how this in turn affects the rate of replication of DNA. <p>Note: candidates must have included the effect of enzymes on the process DNA replication to achieve E.</p> <p><i>Names of specific enzymes not required (see std EN 4).</i></p>

N0	N1	N2	A3	A4	M5	M6	E7	E8
No response or does not address the question.	Some writing but does not fulfil any statement from Achievement.	Provides ONE statement from Achievement.	Provides TWO statements from Achievement.	Provides THREE statements from Achievement.	Explains TWO idea or factor from Merit.	Explains THREE ideas or factors from Merit.	Discusses how TWO factors are linked to DNA replication.	Discusses how THREE factors are linked to DNA replication.

Judgement Statement

	Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
Score range	0 – 7	8 – 13	14 – 18	19 – 24