

## Assessment Schedule – 2014

**Biology: Demonstrate understanding of biological ideas relating to the life cycle of flowering plants (90928)**

## Evidence Statement

ONE	NØ	N1	N2	A3	A4	M5	M6	E7	E8
	No response/no relevant evidence.	ONE idea given.	TWO ideas given.	THREE ideas given.	FOUR ideas given.	<ul style="list-style-type: none"> <li>Explains how seed dispersal is linked to the structure of the seed for THREE examples.</li> </ul>	<ul style="list-style-type: none"> <li>Explains how seed dispersal is linked to the structure of the seed for TWO or more examples.</li> </ul>	<ul style="list-style-type: none"> <li>Discusses the advantages OR disadvantages of seed dispersal to sexually reproducing plants.</li> </ul>	<ul style="list-style-type: none"> <li>Comprehensively discusses the advantages AND disadvantages of seed dispersal AND compares the different seed dispersal methods.</li> </ul>
	(a) Milkweed seed = 1. <b>wind dispresal</b> Sandbur seed = 2. <b>animal dispersal</b> Coconut seed = 3. <b>water dispersal</b> Miro berries = 4. <b>animal dispersal</b>					3/4 Correct required			
	(b) <b>Milkweed seed</b> structure linked to dispersal method.								
	<ul style="list-style-type: none"> <li>light and/or small</li> <li>large surface area to volume ratio</li> <li>fine hairs</li> </ul>		<ul style="list-style-type: none"> <li>to be carried by the wind</li> <li>to be easily carried by the wind (structure must be linked to mode)</li> </ul>			<ul style="list-style-type: none"> <li>Explains TWO <b>different</b> advantages AND TWO disadvantages of seed dispersal to sexually reproducing plants.</li> </ul>	<ul style="list-style-type: none"> <li>Explains <b>two different</b> advantage <u>and</u> <b>two</b> disadvantages of seed dispersal to sexually reproducing plants.</li> </ul>	<ul style="list-style-type: none"> <li>Two methods of dispersal each explaining TWO advantages and TWO disadvantages.</li> </ul>	<ul style="list-style-type: none"> <li>1 advantage and disadvantage of each of the 4 methods of dispersal</li> <li>The advantages and disadvantages in term of the cost of energy to creating the seeds for their different types of dispersal.</li> </ul>
	<b>Sandbur seed</b>					<b>Need to link structure to function</b> (b) NB. <i>Must link the <b>structure</b> of the seed to its method of dispersal.</i> <b>Milkweed</b> seeds are small and light with a large surface to volume ratio. This means that the seeds can be easily picked up and carried by wind currents, far away from the parent plants <b>Sandbur</b> seeds have a seed coat that is covered in spikes which easily get stuck in animal fur, which carry the seeds away from the parent plant, where they drop off and can then germinate. <b>Coconut</b> seeds have a wooden fibrous husk that is less dense. Air which fills the inner seed, this helps the coconut float and be buoyant. It also has an outer layer which is waxy so that it can survive a long time in salt water. <b>Miro</b> berries are red-coloured to attract dispersal agents such as birds (tui and kereru			
	<ul style="list-style-type: none"> <li>rough spikes</li> </ul>		<ul style="list-style-type: none"> <li>Stick to animal fur as the animals brush past the coastal sandbur plant.</li> </ul>						
	<b>Coconut seed</b>								
	<ul style="list-style-type: none"> <li>woody, waterproof, less dense</li> </ul>		<ul style="list-style-type: none"> <li>Helps coconut to float in salt water for long periods of time.</li> </ul>						

			(wood pigeon)). They eat the flesh of the fruit and fly away from the parent plant, and excrete the seeds some distance away from the parent plant.
	<b>Miro berries</b>		Eg: E7
	<ul style="list-style-type: none"> <li>• red-coloured, fleshy fruit</li> </ul>	<ul style="list-style-type: none"> <li>• Brightly coloured fleshy fruit which is eaten by birds and dispersed in their droppings.</li> </ul>	(c) The <b>advantages</b> of seed dispersal are that there is less competition between the parent species. The <b>population can expand</b> into new environments. The seedling that develops is genetically different and provides <b>variation</b> in a local population. OR <b>Disadvantage</b> Takes time and energy for the production of seeds, and must rely on a mechanism for dispersal such as wind or an animal. When there are a low number of animals then seed dispersal is limited.
			Eg: E8 (c) Need to link number of seeds produced by wind dispersed plants which is higher compared with animal dispersed plants paped because they the wind can blow in many directions. And some will land in areas where the conditions water. oxygen and warmth are not present The amount of energy in producing lots of seeds is high in wind dispersed seeds and low in the energy reserves of these types of seeds. Sandbur and miro rely on the animals to disperse their seeds. Miro has bright colours to attract birds to eat the fruit and seeds. The seed makes its way through the digestive tract of the animal. This breaks down the hardened seed coat and prepares the seed for germination. Compared to the sandbur, which relies on animals to pass by, and the seeds will rub onto the fur of the animal and be scratched off in another location further away from the parent plant. This would reduce direct competition with the parent plant for resources such as light, minerals, water and carbon dioxide. The energy into building a structure that catches onto animals is high which is created from the ovary. Relying on animals makes the plant dependent on these animals to disperse their seeds. If the animal populations decrease this leaves fewer animals to be used as seed dispersers, which would mean that competition between the parent plant and its seedlings would be higher. The energy required for producing seeds with a fruit exterior has a larger cost but

			<p>ensures that that dispersal away from the parent plant is successful.</p> <p>In comparison, wind seed dispersal does not require the assistance of animals, and so with water and wind seed dispersal seeds are more likely to be dispersed. However it is random where these seeds end up and they have a greater chance of landing in an area that is not suited to germination and will have a low success rate of germination.</p>
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TWO	NØ	N1	N2	A3	A4	M5	M6	E7	E8
	No response / no relevant evidence.	ONE idea given.	TWO ideas given.	THREE ideas given.	FOUR ideas given.	TWO of: <ul style="list-style-type: none"><li>Explains THREE conditions required for germination.</li><li>Explains how primary growth happens.</li><li>Explains how secondary growth happens.</li></ul>	THREE of: <ul style="list-style-type: none"><li>Explains THREE conditions required for germination.</li><li>Explains how primary growth happens.</li><li>Explains how secondary growth happens.</li></ul>	TWO of: <ul style="list-style-type: none"><li>Explains all three conditions required for germination, and links it to successful germination.</li><li>Explains how primary and secondary growth happens, and links it to where it occurs.</li><li>Discusses the importance of primary and secondary growth.</li></ul>	THREE of: <ul style="list-style-type: none"><li>Explains all three conditions required for germination, and links it to successful germination.</li><li>Explains how primary and secondary growth happens, and links it to where it occurs.</li><li>Discusses the importance of primary and secondary growth.</li></ul>
	<b>N0 – A4</b> (a) <ul style="list-style-type: none"><li>Miro seeds require: water/moisture and warmth.</li></ul> (c) <ul style="list-style-type: none"><li>Description of primary and secondary growth (direction of growth).</li><li>Primary growth is the growth of the miro/plant upwards/vertically and secondary growth causing the miro plant to get wider or thicker. Must have both for achieved.</li><li>Primary growth occurs in the apical meristem.</li><li>Secondary growth occurs in the cambium.</li></ul>								
	<b>Explanations required for M5 – E8</b> (a) <b>Water</b> is required by the miro seed for the seed to swell, break its testa/seed coat. (b) <b>Water</b> is required to activate the enzymes in the testa of the seed. <b>Oxygen</b> is required by the cells, which breaks down the starch in the testa to produce glucose required for respiration. <b>This provides the energy required</b> for the early cell division and therefore growth of the embryo/epicotyl/plumule/radicle. <b>Warmth</b> is required which keeps the enzymes responsible for converting the starch to glucose for respiration at a temperature which they are most active and able to convert the most glucose per unit time. (c) <ul style="list-style-type: none"><li><b>Primary growth</b> is important in the early life of a seedling as this young plant grows upward towards the canopy to get more light and therefore produce more energy for the early growth of the plant.</li><li>Primary growth occurs in the tips of roots and shoots, increasing their length through cell division and then cell enlargement. The cells enlarge as their vacuoles fill with water, causing the cells to become bigger as the cell walls are elastic and expand. The cell division and forming of new cells continue to occur at the apical meristem.</li><li><b>Secondary Growth.</b> The vertical growth needs to be supported by the horizontal growth or thickness. This is where the lower basal side of the trunk grows wider/thicker to support the primary growth of the seedling vertically.</li><li>Secondary Growth occurs in the cambium, which is found in the middle of the vascular bundles. New cells are made here. Cells produced towards the inside become secondary xylem cells, and cells produced to the outside become secondary phloem cells. The outer phloem cells crush together to form the bark, a layer which provides protection from the outside environment.</li></ul>							(c) <b>Primary Growth</b> occurs in the apical meristems of plants. This is where the cells in the shoot tip and root tip divide by mitosis. This is called the zone of division, and is followed by the zone of growth where the cells elongate (get larger, zone of elongation where the cells grow larger) because the water enters the cells and fills the vacuoles which causes the cell membrane and wall to stretch and elongate. Finally followed by the zone of differentiation where the cells then specialise to become a certain cell type. This process of cells dividing and elongating, and specialising into other cells such as root hairs etc, causes the plant to grow longitudinally (up and down vertically). This allows the cells to differentiate and form specialised tissues to carry out particular functions e.g. leaves for photosynthesis, while also allowing the plant to grow upwards in order to gain more sunlight to carry out photosynthesis for nutrition and out-compete other plants.	

		<p><b>Secondary growth</b> occurs in the cambium of the stem where the vascular cambium layer cells divide to produce primary xylem cells inside the cambium layer and primary phloem cells outside the cambium. Each time the cambium divides, the width of the stem increases in girth and gets wider. When growth stops or slows down, the secondary xylem forms a series of growth rings. This produces the rings seen on tree trunks like the one in the diagram.</p> <p>Secondary growth develops the internal transport system (xylem for transport of water and phloem for transport of starch/glucose) of the plant to transport glucose made in the leaf by photosynthesis to other parts of the plant where the process of <b>respiration</b> can be used to provide energy for division in those areas.</p> <p><i>(Links in respiration to provide energy for growth in other parts of the plant.)</i></p>
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THREE	NØ	N1	N2	A3	A4	M5	M6	E7	E8
	No response / no relevant evidence.	ONE idea given.	TWO ideas given.	THREE ideas given.	FOUR ideas given.	<p>TWO of:</p> <ul style="list-style-type: none"> <li>Explains the importance of starch being produced in the green regions of the leaf.</li> </ul>	<p>THREE of:</p> <ul style="list-style-type: none"> <li>Explains the importance of starch being produced in the green regions of the leaf.</li> </ul>	<p>TWO of:</p> <ul style="list-style-type: none"> <li>Links adaptations to improving photosynthesis.</li> <li>Compares the palisade cells and the spongy mesophyll cells.</li> </ul>	<p>THREE of:</p> <ul style="list-style-type: none"> <li>Links adaptations to improving photosynthesis.</li> <li>Compares the palisade cells and the spongy mesophyll cells.</li> <li>Links specialised features and structures of the leaf to the overall efficiency of photosynthesis.</li> </ul>
	<p>(a) Starch turns blue-black in the presence of iodine solution. Indicating that photosynthesis takes place in the green parts of the leaf, AND not in the white part.</p> <ul style="list-style-type: none"> <li>Colour linked to starch.</li> </ul> <p>AND</p> <p>Change in colour linked to photosynthesis occurring in the green area.</p> <ul style="list-style-type: none"> <li>Chloroplasts / chlorophyll linked to photosynthesis.</li> </ul> <p>(b) Chloroplasts are the organelles involved in photosynthesis, they trap light to be converted to chemical energy.</p> <ul style="list-style-type: none"> <li>Leaf is wide (broad) and flat.</li> <li>The leaf has a spongy mesophyll cell layer with large intra-cellular spaces.</li> <li>Waxy cuticle.</li> <li>Dark green from lots of chloroplasts.</li> </ul>					<p>• Explains TWO structures of the leaf which help with photosynthesis.</p>	<p>• Explains BOTH palisade and spongy mesophyll cells.</p> <p>• Explains TWO further structures of the leaf which help with photosynthesis.</p>	<p>• Links specialised features and structures of the leaf to the overall efficiency of photosynthesis.</p> <p>• Must link the adaptation of the leaf to increasing the reactants for photosynthesis ie CO<sub>2</sub>, H<sub>2</sub>O and sunlight.</p>	
						<p>(a) The results in the experiment show where starch is located in the leaf. This indicates that photosynthesis has been occurring in the leaf on the outside in the green area, where chloroplasts are and can carry out photosynthesis and so starch is made. The white parts of the leaf don't have any chloroplasts and so no starch is made, which is indicated by no colour change to the white area. Because starch is produced only in the area that was green, we can conclude that chlorophyll/ chloroplasts must be necessary to carry out photosynthesis. The white area of the leaf has no</p>		<p>(b) <b>Comparison of the palisade cells and the spongy mesophyll cells.</b> The palisade layer has specific adaptations to increase light absorption, such as a greater number of chloroplasts and how they are organised length ways, compared to the spongy mesophyll, which are irregular in shape, have less chloroplasts and are specially adapted to reflect light back through the palisade layer and so providing a second chance to get absorbed. The spongy mesophyll also provides air spaces for CO<sub>2</sub></p>	

		<p>chloroplasts, so no photosynthesis has occurred.</p> <p>(b)</p> <p><b>Explanations of adaptations which assist photosynthesis.</b></p> <ul style="list-style-type: none"> <li>• The leaf is broad and flat/thin which increases surface area to volume ratio and increases the surface through which light can be absorbed.</li> <li>• And thin to allow the quick diffusion of gases to the site of photosynthesis – the palisade layer (short diffusion distance).</li> <li>• The waxy cuticle is a clear waterproof layer which prevents the loss of water which is required for photosynthesis. This layer prevents the loss of water by evaporation while allowing light to pass through.</li> <li>• The epidermal layer provides a thin layer of cells, which are transparent to allow the red and blue wavelengths of light through and provide protection to the cells below.</li> <li>• The guard cells for the stomata are where the carbon dioxide gas diffuses through to get to the chloroplasts found in the palisade cells and in the mesophyll layer.</li> </ul> <p><b>Explanation of palisade cells and spongy mesophyll cells</b></p> <ul style="list-style-type: none"> <li>• The palisade mesophyll layer is found at the top of the leaf because these cells are specialised for absorbing the most sunlight. They can do this because they are long, with more chloroplasts than other cells found in the leaf. They absorb most of the light that first filters through the leaf because their cells are arranged longitudinally to allow more chloroplasts to be exposed to the light passing through the leaf.</li> <li>• The spongy mesophyll layer is found in the middle of the leaf. These cells have intracellular spaces producing air spaces in the leaf, which allows the carbon dioxide to diffuse through to get to the palisade cells, and oxygen to diffuse out of leaf. The irregular shape also reflects any remaining light back through the leaf to be used by palisade cells.</li> </ul>	<p>to diffuse through the leaves to get to the palisade layer and chloroplasts so that photosynthesis can occur.</p> <p><b>Link specialised features and structures to the overall efficiency of photosynthesis.</b></p> <p>The more effectively a plant can carry out photosynthesis, the greater its chances are of survival. Thus all the adaptations a leaf has are to increase the efficiency of photosynthesis and maximise light absorption and hence starch production. For example the more chloroplasts a leaf has in its palisade cells, the darker green it appears, and the way that the palisade cells are organised long ways with regular shapes closely packed together ensures the more sunlight it can trap, to then be converted to chemical energy by photosynthesis.</p>
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**Cut Scores**

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