Assessment Schedule – 2023

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

Assessment Criteria

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate ***understanding*** involves: • defining, using annotated diagrams, and giving characteristics of, or an account of, the life cycle of flowering plants.	*Demonstrate* ***in-depth understanding*** involves: • explaining the plant processes and biological ideas relating to the life cycle of flowering plants.	*Demonstrate* ***comprehensive understanding*** involves: • linking biological ideas relating to the life cycle of flowering plants; and may involve explaining, elaborating, applying, justifying, relating, evaluating, comparing and contrasting, or analysing.

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 14	15 – 19	20 – 24

Evidence

Question One

Achievement	Achievement with Merit	Achievement with Excellence
Describes (simple ideas, including definitions): *The formation of a seed / fruit* may include: • Seed forms after a flower has been fertilised / pollinated. • Ovules become the seeds. • Ovary /receptacle becomes the fruit. *Why a seed is important* may include: • Allows male and female gametes to contribute genetic material to offspring. • Allows for dispersal, distant from parent plant. • The fruit helps with dispersal of the seed. • Testa / seed coat protects seed from water entering while fruit moves through digestive tract of a bird. *Seed dispersal* may include: • Birds are attracted to the bright colour of the fruit. • The fruit contains sugar / nutrients that is beneficial to the bird. • The fruit also contains seeds. • The seeds are egested / pooed out further away from parent plant. *Other accurate descriptions will also be accepted.*	**Explains** (gives reasons how or why, using biological ideas): *How a seed and fruit is formed* may include*:* • After fertilisation, the ovules develop into the seeds. Then, when the seed is in the right growing conditions, it will grow into a new plant. • After fertilisation, the ovary will become the fruit which carry the seeds ready to be dispersed. *Why dispersal is important* may include: • Dispersal of seeds reduces competition with the parent plant. • Seeds allow the life cycle of the plant to continue and pass genetic information on to the next generation, allowing for more successful dispersal. *How the structure of the pūriri seed enables the environment to disperse them successfully* may include: • The testa of a pūriri seed will be resistant to the digestive juices / chemicals found in the digestive system of birds. • The receptacle / ovary wall contributes the fleshy / edible part of the fruit which is attractive to dispersers. *Other accurate explanations will also be accepted.*	**Discusses** (making multiple links): *How the structure of the pūriri seed and fruit enables the environment to disperse them successfully* may include: • Because there is red / pink, sugar-rich / fleshy / juicy fruit surrounding the seed (sometimes called the berry), birds are attracted to them to eat them. The fruit are also small which encourages birds to eat them, as well as making it possible to carry the fruit a distance from the plant. They swallow the entire fruit, which contains the seeds. As they fly around and are active, they digest the fruit, and egest the seeds after the fruit has made its way through the bird's gut. This is likely to be in a location far from the tree that the fruit came from. *Why the dispersal method is beneficial to the flowering plant* may include: • Dispersal is important because it spreads the seeds away from the parent plant, reducing competition between the parent and other offspring for water, light, space for growing, etc. • Dispersal by a bird / animal allows for the possibility of seeds colonising / surviving in a new area with suitable conditions, establishing a new population of the species / plant. *Other accurate discussions will also be accepted (making multiple links between ideas).*

N1	N2	A3	A4	M5	M6	E7	E8
Partial / limited attempt to give ONE Achievement idea.	Any TWO Achievement ideas given, with some detail.	**Describes** any THREE ideas with some detail on: • biological characteristic of a seed • biological characteristics of a fruit • the purpose of a seed / fruit • seed dispersal • benefit to the plant	**Describes** any FOUR ideas on: • biological characteristic of a seed • biological characteristics of a fruit • the purpose of a seed / fruit • seed dispersal • benefit to the plant.	**Explains:** • seed OR fruit formation **AND** • the purpose of seed dispersal.	**Explains:** • seed and fruit formation **AND** • the purpose of seed dispersal.	**Discusses**: • how the structure of the pūriri seed and fruit enables the environment to disperse them successfully **AND** • the reason why dispersal is beneficial to the plant.	**Comprehensive discussion** of: • how the structures of the pūriri seed and fruit seed enables the environment to disperse them successfully **AND** • reasons why dispersal is beneficial to the plant.

N0 = No response; no relevant evidence.

Question Two

Achievement	Achievement with Merit	Achievement with Excellence
Describes (simple ideas, including definitions): *The process of pollination* may include: • Pollination is the transfer of pollen from the anther of one flower to another flower / stigma (or within the same flower). Pollination can occur via wind / insect / bird, for example: Animals / insects / birds pick up pollen from the male anthers and carry it to the female stigma; flowers have different shapes, colours, smells, and often sugary nectar, to encourage animals to visit and pollinate them. Wind-pollinated flowers are shaped to make it easy for the wind to pick up pollen and transport it in the air. *The process of germination* may include: • Germination is the development / growth of the seed into a seedling. • Germination starts with growth of the radicle (young root) growing through the seed coat. • Enzymes inside the seed are involved in germination. • The endosperm / food store of a seed provides the energy for germination to occur. • The plumule grows into the first shoot of the plant. • The first leaves of the seedling will start to photosynthesise. • Some seeds require scarification before they can germinate. • Some seeds required vernalisation before they can germinate. *How the structure of the flower leads to successful pollination by birds* may include mention of: • Large flowers. • Usually red or yellow. • Lots of energy-rich / sugary nectar in them. • Often the branches are strong enough to take a bird's weight.	**Explains** (gives reasons how or why, using biological ideas): *Process of germination* may include: • Germination begins with the seed taking in water and oxygen (via the micropyle) because water is required to activate the enzymes required for energy for growth, and oxygen is required for respiration to release the energy from the cotyledon / endosperm / food store. • Water increases the number and speed of chemical reactions occurring in the seed, and the embryo plant begins to grow. • The radicle breaks through the seed coat and into the surrounding environment because the radicle or young root needs to absorb more water from the surrounding environment so that germination and growth of the seedling can continue. • As respiration increases, it uses the starch (energy) stored in the cotyledon, and it is used until the seedling can expose its first leaves to the sunlight for photosynthesis. • The radicle breaks through the seed coat and into the surrounding environment because the radicle or young root needs to absorb more water from the surrounding environment so germination and growth of the seedling can continue. *Process of pollination* may include: • Pollination is the transfer of pollen from the anther to the stigma in a flower. This occurs so that the male sex cell / gamete / sperm is closer to / able to reach the female sex cell / gamete / egg / ovule for seed formation. The pollen tube grows towards the ovary because the ovary releases chemicals which guide the growth. *Other accurate explanations will also be accepted.*	**Discusses** (making multiple links): *The effect of environmental factors on the process of pollination and germination* may include: • For germination to occur, the ngutukākā seed must absorb water via the micropyle because the water is required to activate the enzymes required for energy, in order for growth to be released from the food store. Oxygen is also absorbed through the micropyle. Oxygen is required by the ngutukākā seed so that aerobic respiration can occur in the seed and germinating seedling, allowing the release of energy for growth to occur. The ngutukākā seed will also require light (gaps) which is detected by light sensitive proteins (phytochromes) in the seed. This triggers the germination process if other factors are not limited. • Pollination is the transfer of pollen from the anther to the stigma in a flower. This occurs so that the male sex cell / gamete / sperm is closer to / able to reach the female sex cell / gamete / egg / ovule for seed formation. The pollen tube grows towards the ovary because the ovary releases chemicals which guide the growth. • The ngutukākā pollen can't get from the anthers to the ovules on its own so, in order to pollinate, the plant relies on nectar-feeding birds, with appropriately shaped beaks, for the transfer. This helps to increase genetic variation which is advantageous for the ngutukākā species. *Other accurate discussions will also be accepted (making multiple links between ideas).*

Achievement	Achievement with Merit	Achievement with Excellence
• Shape allows bird to stick the tongue in and suck / brush up the nectar. *Specific environmental conditions required for germination* may include: • Germination requires water / moisture, oxygen, and certain changes in temperature / warmth. • The seed needs to absorb water before germination can begin. • Temperature needs to be high enough for reactions to occur, but not so high that enzymes are denatured. *Other accurate descriptions will also be accepted*		

N1	N2	A3	A4	M5	M6	E7	E8
Partial / limited attempt to give ONE Achievement idea.	Any TWO Achievement ideas given, with some detail.	**Describes** any THREE Achievement ideas with some detail on: • pollination • germination • structure of the flower • environmental condition for germination.	**Describes:** • pollination • germination • structure of the flower • environmental condition for germination.	**Explains** any TWO Merit ideas: • the process of pollination • the process of germination • the structure of the flower and successful pollination by birds.	**Explains:** • the process of pollination • the process of germination • the structure of the flower and successful pollination by birds	**Discusses**: • the effect of environmental factors on the process of germination on the ngutukākā seed. **OR** • the processes of pollination **and** germination, making comparisons and contrasts.	**Comprehensive discussion** of: • the effect of environmental factors on the process of germination on the ngutukākā seed. **AND** • the processes of pollination AND germination, making comparisons and contrasts.

N0 = No response; no relevant evidence.

Question Three

Achievement	Achievement with Merit	Achievement with Excellence
Describes (simple ideas, including definitions): *The process of primary growth* may include: • Plants need raw materials to grow (e.g. water, sugars, proteins). • Primary growth makes plants taller / increase in height / length OR creates differentiated cells. • Primary growth occurs from meristems / tips. • Primary growth is important to allow the plant to access light / roots to access water. *The process of secondary growth* may include: • Secondary growth is when the stem grows wider. • Secondary growth results in (secondary) xylem / phloem. • Secondary growth occurs from the cambium / lateral meristem cells (between the xylem and phloem in vascular tissue). • Secondary growth gives stability / support / transport / anchorage. *Other accurate descriptions will also be accepted.*	**Explains** (gives reasons how or why something occurs / provides examples): *Similarities and differences between primary and secondary growth* may include: • Primary growth is occurring at the apical meristem and root tips, increasing the number of cells and the length / height of the plant. This enables plants to absorb water via roots or sunlight via shoot cells. Root hair cells that grow downwards absorb water via osmosis to help with the plant's photosynthesis. • Secondary growth occurs in plants that live longer and involves cells in the cambium layer dividing to form new cells, and then differentiating to become xylem and phloem, while the old cells become bark and wood. Cells outside the cambium layer differentiate to become phloem cells, which enables them to transport nutrients around the plant. Cells inside the cambium layer become xylem cells, which transport water and minerals throughout the plant. • They are similar processes in that they both involve mitosis / cell division and cell differentiation / cell specialisation. • They are different because different layers / tissues are formed. Primary growth results in more length, secondary growth in more width.	**Discusses (making multiple links):** *The significance of both primary and secondary growth* • Primary growth is important to the flowering plant because it allows the plant to grow taller and out-compete other plants for access to sunlight, which is needed for photosynthesis. It allows the plant to develop specialised cells, such as chloroplasts in leaves for photosynthesis or flowers for reproduction, or roots for increased absorption of water / nutrients and stability. • Secondary growth is important because it provides the xylem and phloem to transport water (xylem) and glucose (phloem) around the plant for further growth of leaves for photosynthesis / flowers for reproduction / support respiration for further growth / reproduction. • It is also important to provide the plant with support. Older phloem and xylem cells are no longer able to carry out their original function, however they become bark / wood. Bark may also provide protection against grazing herbivores, insects, bacteria, etc. These stronger stems will also support branches with many leaves and flowers, thus continuing to increase the rate of photosynthesis and reproduction. *The timing of both processes may include:* • Primary growth occurs throughout the plant's lifespan, allowing the plant to gain height and access light needed for photosynthesis, important for germinated plants. This process usually occurs in the spring-growth season with one growth ring produced annually. • Secondary growth would continuously occur if there were no limiting factors / resources (water / nutrients / sunlight / space). It occurs in preparation for the development of flowers / seeds / fruit etc. The thickness produced by secondary growth helps physically support gains in height produced later in the plant's life cycle through primary growth.

N1	N2	A3	A4	M5	M6	E7	E8
Partial / limited attempt to give ONE Achievement idea.	Any TWO Achievement ideas given, with some detail.	**Describes** any THREE Achievement ideas with some detail on: • primary growth • secondary growth • a significance of primary growth • a significance of secondary growth.	**Describes:** • primary growth • secondary growth • a significance of primary growth • a significance of secondary growth.	**Explains** any TWO Merit ideas: • the process of primary growth • the process of secondary growth • a similarity and difference between primary and secondary growth.	**Explains:** • the process of primary growth • the process of secondary growth • a similarity and difference between primary and secondary growth.	**Discusses**: • the significance of primary and secondary growth.	**Comprehensive discussion** of: • the significance of primary and secondary growth **AND** • the timing of primary and secondary growth.

N0 = No response; no relevant evidence.