Assessment Schedule – 2019

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

Evidence Statement

Q	Achievement	Merit	Excellence
ONE	**Describes** (single, simple ideas): • ways kūmara reproduce sexually • ways kūmara can reproduce asexually. **Examples** of possible descriptions include: • Kūmara reproduce sexually by producing flowers / seed. • Kūmara can reproduce asexually through enlarged lateral root / tuber / storage root. • Kūmara can reproduce asexually through horizontal growth of the vine (runners?). • Kūmara can reproduce asexually by humans taking cuttings and planting them.	**Explains** (gives reasons and examples): • how kūmara reproduce sexually • how kūmara reproduce asexually. **Examples** of possible explanations include: • Kūmara can reproduce sexually. This means that they go through the process of producing flowers with anthers that produce the male sex cell, pollen and the female sex cell, ova. In order to produce seeds, the processes of pollination and fertilisation must occur. • Pollination is when pollen is transferred from anther to stigma of the flower. The pollen grows a tube down the style of the flower so that the pollen with the male sex cells are brought close to the female sex cell on the ovule to allow fertilisation to occur. • Fertilisation is when the male sex cells from the pollen join with the female sex cells in the ovule, resulting in a zygote, which develops into a seed, and ultimately a new plant. • Plants like kūmara can also reproduce asexually. One way it does this is by storing starch in its roots. The starch in the kūmara storage root is there due to the process of photosynthesis. This process occurs in the leaves of the kūmara and requires light energy, CO_2 and water to occur. It transforms light energy into chemical energy in the form of glucose, so that it can then be stored as starch in the roots. The swollen roots, i.e. the kumara, can then grow into a new plant when environmental conditions are right, and thus the life cycle continues.	**Discusses** (makes links between explanations): • advantages of sexual reproduction • disadvantages of sexual reproduction • advantages of asexual reproduction • disadvantages of asexual reproduction. **Examples** of possible discussions include One advantage to the plant of sexual reproduction is the seeds produced will be genetically different to the parent plant. This increases the variation in the kūmara population, which is an advantage because it may allow some of the kūmara plants to survive a disease. Those that survive will reproduce and are likely to produce offspring that will also be resistant. However if all the kūmara plants were genetically identical, as they would be from asexual reproduction, the whole kūmara population may die as a result of the disease, because they will be equally susceptible. A disadvantage to the plant of sexual reproduction is that it it requires energy from the plant to produce flowers. This energy demand requires that the plant has produced / stored sufficient energy from photosynthesis to do this. This energy could otherwise be used in plant growth. Another disadvantage of sexual reproduction is that in some cases it requires more than one plant to be present for male and female sex cells to be present for pollination and fertilisation and seed production to occur. This is an advantage of asexual reproduction, in that it can occur with only one plant present, thus it is able to grow a kūmara population from a single plant.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response / no relevant evidence.	ONE relevant idea given.	TWO relevant ideas given.	THREE relevant ideas given.	FOUR relevant ideas given.	Explains TWO relevant ideas.	Explains THREE relevant ideas.	Compares and contrasts TWO advantages and TWO disadvantages.	Compares and contrasts more than TWO advantages and more than TWO disadvantages.

Q	Achievement	Merit	Excellence
TWO	**Describes** (single, simple ideas): • seed germination • plant growth • different environmental conditions in spring and summer. Etc. **Examples** of possible descriptions include: • Seed germination is when the new plant starts to emerge from the seed coat. • Seed germination requires warmth, water, and oxygen. • Plant growth is when the plant increases in the number of cells (cell division). • Plant growth in height is caused by cell division and elongation. • Plant growth requires energy from photosynthesis to occur. • Photosynthesis requires water, CO_2 and light energy (chlorophyll, warmth). • Germination requires enzymes to be activated. • Energy for seed germination comes from the cotyledon. • Energy for plant growth comes from photosynthesis. Etc.	**Explains** (gives reasons and examples): • how seed germination occurs • how plant growth occurs • the impact of changed environmental factors on the growth of a plant • explains the energy source for plant growth • explains the energy source for seed germination. Etc. **Examples** of possible explanations include: • Seed germination and plant growth increase in the spring and summer months. This is because to maximise both processes certain environmental factors are required. • For example, warmer temperatures, such as those in spring and summer, increase the rate of germination and growth because both processes are controlled by enzymes, which work more quickly in optimal warmer temperatures. Thus we see the rate of germination and growth increase. • The energy required for plants to grow comes from the glucose produced in the process of photosynthesis. This allows cell division to occur and thus the plant to grow. Sometimes plants can grow using energy stored in the roots as starch, such as kūmara or potato. • Seeds use the energy stored in their food store or cotyledon (or endosperm in monocots) to germinate. This energy is in the form of starch, which is transformed into glucose by the enzymes in the seed at the start of the germination process. The enzymes are activated by water and warmer temperatures. Etc.	**Discusses** (compare and contrast, makes links between explanations): • Makes links between environmental factors and the rate of photosynthesis as a source of energy for growth and starch storage in the seed for germination. • Compares and contrasts the energy source for plant growth with the energy source for seed germination. **Examples** of possible discussions include: Seeds cannot photosynthesise to gain energy for the process of germination so therefore need another source of energy. This is in the form of the starch-filled cotyledon or endosperm within the seed itself. The energy required for plants to grow comes from the glucose produced in the process of photosynthesis. This allows cell division to occur and thus the plant to grow. Sometimes plants can also grow using energy stored in the roots as starch, such as kumara or potato. Seeds, on the other hand, can only use the energy stored in their food store or cotyledon (or endosperm in monocots) to germinate. This is because seeds cannot photosynthesise to gain energy for the process of germination, so therefore need another source of energy. This is in the form of the starch-filled cotyledon or endosperm within the seed itself. The starch is transformed into glucose by the enzymes which are activated by water and warm temperatures at the start of the germination process. ETC

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response / no relevant evidence.	ONE relevant idea given.	TWO relevant ideas given.	THREE relevant ideas given.	FOUR relevant ideas given.	Explains ONE relevant idea.	Explains TWO relevant ideas.	Discusses TWO ideas.	Discusses THREE ideas.

Q	Achievement	Merit	Excellence
THREE	**Describes** (single, simple ideas): • the process of pollination • the process of fertilisation • the process of seed formation • the importance to the life cycle. **Examples** of possible ideas include: • Pollination is the transfer of pollen from the anther to the stigma of a flower. • Fertilisation occurs when the male sex cell in the pollen fuses with the female sex cell / ova / egg / ovule in the ovary. • Seed formation occurs after fertilisation, resulting in a new plant being formed. • The importance of seed formation is that it allows for the continuation of the species / allows for dispersal. Etc.	**Explains** (gives reasons and examples): • the process of pollination • the process of fertilisation • the process of seed formation. **Examples** of possible explanations include: • Pollination is the transfer of pollen from the anther to the stigma of a flower. This can occur in a number of ways depending on the type of flower. For example, some flowers are pollinated by insects and others by wind. Pollination ensures that the male and female sex cell are brought together so that fertilisation can occur. Etc.	**Discusses** (makes links between explanations) the importance to the life cycle of: • pollination • fertilisation • feed formation. **Examples** of possible discussions include: • Pollination is the transfer of pollen from the anther to the stigma of a flower. This can occur in a number of ways, depending on the type of flower. For example, some flowers are pollinated by insects, and others by wind. Pollination ensures that the male and female sex cell are brought together so that fertilisation can occur. This is important because without it, fertilisation would be more difficult and thus seed formation would not occur. • Fertilisation occurs when the male sex cell in the pollen fuses with the female sex cell / ova / egg / ovule in the ovary. This can occur only once pollination has occurred. Once the pollen has been transferred from anther to the stigma of the flower, the pollen grows a pollen tube down the style and into the ovary. This is so that the male sex cell in the pollen is brought right up to the female sex cell or ovule, thus making fertilisation possible. Fertilisation is important to the lifecycle of a flowering plant because it combines genetic material from the male sex cell and female sex cells, resulting in a seed which is genetically different to the parents, increasing variation and survival in the new plants. Etc.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response / no relevant evidence.	ONE relevant idea given.	TWO relevant ideas given.	THREE relevant ideas given.	FOUR relevant ideas given.	Explains ONE relevant idea.	Explains at least TWO relevant ideas.	Discusses the importance of ONE idea to the lifecycle of the flowering plant.	Discusses the importance of TWO ideas to the lifecycle of the flowering plant.

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 8	9 – 14	15 – 19	20 – 24