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Level 1 Biology, 2017

90928 Demonstrate understanding of biological ideas relating to the life cycle of flowering plants

9.30 a.m. Thursday 16 November 2017

Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of biological ideas relating to the life cycle of flowering plants.	Demonstrate in-depth understanding of biological ideas relating to the life cycle of flowering plants.	Demonstrate comprehensive understanding of biological ideas relating to the life cycle of flowering plants.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–8 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

Merit

TOTAL

17

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QUESTION ONE: POLLINATION

Pollination is an important part of a plant's life cycle. Pollination can occur in a number of different ways. Use the following pictures and diagrams to help you answer the question below.



Tūī in a kōwhai tree.

www.tonywhitehead.com/wildlight/2012/10/tuis-in-the-kowhai/

Diagram of kōwhai flower.

<http://sciencelearn.org.nz/Contexts/Pollination/Sci-Media/Images/Cutaway-kowhai>



Maize flowers releasing pollen.

<http://sciencelearn.org.nz/Contexts/Pollination/Sci-Media/Images/Maize-flowers-releasing-pollen>

Diagram of a wind-pollinated flower.

<http://slideplayer.com/slide/4027685/>

Compare and contrast pollination carried out by the wind and pollination carried out by an animal such as an insect or bird, and discuss why pollination is important in the life cycle of a flowering plant.

In your answer:

- describe the process of pollination
- explain the similarities and differences between wind pollination and pollination carried out by an animal such as a bird or an insect
- discuss the importance of pollination to the life cycle of all flowering plants.

Pollination is the transfer of pollen from the anther to a stigma of the same plant or a different plant. Pollen that is produced by wind pollinated plants are smooth, light and small. E.g. the maize flower releasing pollen. Pollen produced by insect pollinated plants are rough, large and sticky. The rough structure of the pollen is attached by animals such as

bees who want nectar. As the bee sucks the nectar, the pollen sticks to the bee, when the bee leaves and searches for more nectar, the pollen is brushed off onto the plant. The smooth and light structure of wind pollinated plant help it be aerodynamic, allow it to travel in the wind. The anther and stigma dangle ^(externally) ~~externally~~ the ~~pollen~~ in wind pollinated plants, this increases surface area and chances of the wind catching it. Also the pollen produced is in large quantities which also help increase the chance of pollination (pollen landing on stigma). Insect pollinated plants have their anther and stigma located internally. Their petals are brightly coloured and attract insects towards them, thus the pollen can be attached to them because they are on/inside the flower. E.g. the Tui in a kōwhai tree is attracted to its bright yellow petals. Pollination is important because it allows for fertilisation to occur. The pollen from ~~exactly~~ the wind/insect will land on the stigma. This will cause a pollen tube to form. The pollen tube will move down through the micropyle into the ovum. The petals will fall off and the ovary will swell and the seed will develop while the fertilised egg becomes the fruit. This will advertise the fruit to animals and make them want to eat it. The fruit will ^(be or) ~~be~~ fleshy + juicy and ~~bright~~ the animal will eat it and deposit it somewhere else if it's seeds. This will help because it reduces the competition between parents and plants for factors such as light, space to grow and water. It also allows for the plant to establish a new population and colonise that area. This all helps to ensure the life cycle of plant to continue. //

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QUESTION TWO: SEXUAL AND ASEXUAL REPRODUCTION

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Some flowering plants are able to reproduce both sexually with flowers, and asexually through tubers, rhizomes, runners or bulbs. Below are pictures of some ways flowering plants reproduce.



Strawberry plant showing runners and flowers.

<https://bonnieplants.com/wp-content/uploads/strawberry-plant-Illustration-web.jpg>

Bulbs of onion and garlic.

www.dreamstime.com/stock-images-bulbs-garlic-onion-image4947184



Potato plant showing tubers and flowers.

www.shutterstock.com/image-photo/potato-plant-tubers-soil-dirt-isolated-101102626

Ginger plant rhizome.

www.tutorvista.com/content/biology/biology-iii/angiosperm-morphology/underground-stem-modifications.php

Compare and contrast the advantages and disadvantages to a plant of being able to reproduce both sexually and asexually.

Your answer should:

- describe the purpose of reproduction in plants
- explain how at least TWO of the following: tubers, bulbs, rhizomes, and runners, allow a plant to reproduce asexually.
- discuss the overall advantages and disadvantages to a plant of reproducing sexually, asexually, or both.

Reproduction in plants is important because it allows the plant to produce offspring. Sexually reproduced offspring are genetically unique, unlike asexual

offspring which are clones of their parents. Sexually reproduction produces genetically unique offspring. This will allow the plant species to survive longer as they are not susceptible to diseases ^(environmental) ~~and~~ changes. Asexual reproduction is fast and only requires 1 parent. This allows the plant to produce offspring at a rapid rate and colonise an area quickly. However, if a disease or environmental change occurs, all the offspring are ~~are~~ susceptible and could die because they are all genetically the same. Sexual reproduction may provide survival of a plant species but it requires ~~at~~ a lot of time and energy along with requiring suitable environment (it's seasonal) such as spring. Plants that produce asexually and sexually can produce offspring during the time when conditions are not suitable for sexual reproduction. This will allow the plant to reproduce offspring that are clones and those which are genetically unique. Allowing it to colonise faster and ensure survival.

QUESTION THREE: GERMINATION AND GROWTH

Successful germination of seeds is an important part of the life cycle of a flowering plant.

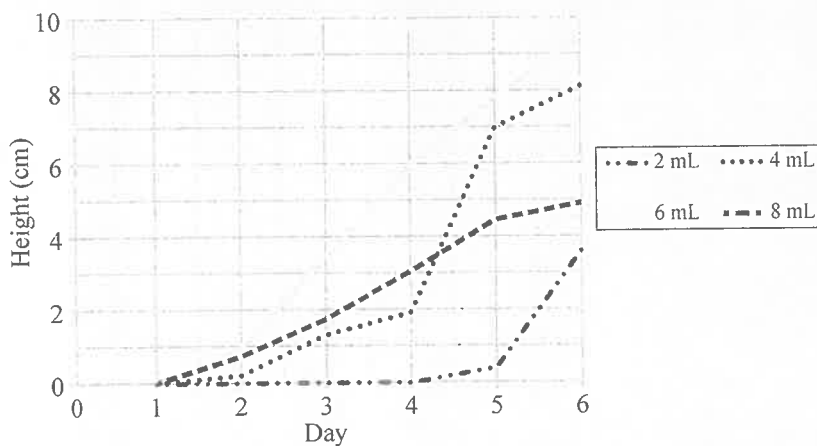
A student dissected a seed and set up some experiments to find out about the environmental factors that are important for seed germination and seedling growth.

After some of the seeds germinated, the student wanted to find out more about how different volumes of water affected the growth of the seedlings, and graphed the results.



<http://www.mysmartgarden.org.au/en/Resources/Food/Seed-Saving-Workshop>

The effects of different amounts of water on seedling growth



adapted from: <http://aaryamsience.blogspot.co.nz/2015/10/mung-bean-plant-research.html>

Discuss how environmental factors can affect successful seed germination and growth of a seedling.

In your answer:

- describe the environmental factors required for seed germination to occur
- explain the purpose of different parts of a seed in germination
- describe how different volumes of water can affect the growth of a seedling
- discuss how environmental factors and the parts of a seed and seedling, work together to allow the seed to germinate and grow.

In order for germination to occur there needs to be warmth, water and oxygen. Water is absorbed by the seed, it enters through the micropyle. This is important because it activates the enzymes required for energy for growth to be released from the food store. Water swells the testa allowing the radicle to grow out and down towards the soil. The radicle becomes the root and is responsible for transporting nutrients from the soil to the plant. After the radicle, the plumule grows out and up towards the light. The

plumule become the stem of the plant. Oxygen is also absorbed through the micropyle. Oxygen allows for aerobic respiration to occur in the seed and germinating seedling, it allows for the release of energy for growth to occur.

~~Water~~ Warmth is important because it assist the enzymes which convert starch to glucose by providing the most ^(favourable) ~~best~~ temperature so the enzymes can operate at the best possible rate. The cotyledon is important because it the seeds food store and initial energy supply for germination. The different volumes of water effect the amount of enzymes activated during germination. By increasing the volume of water there is an increase in enzyme production and thus the growth rate of the seed. //

Subject: Biology		Standard: 90928	Total score: 17
Q	Grade score	Annotation	
1	M6	This response provides evidence towards M6 because it explains with reasons a comparison of pollen appearance, anther/stigma location and petal colour on insect/animal and wind pollinated flowers. To reach Excellence, it needed to link these features to the importance of maximising pollination for seed formation or increasing genetic variation.	
2	M5	This response provides evidence towards M5 because it explains an advantage of sexual reproduction (increases genetic variation) and a disadvantage of asexual reproduction (decreased genetic variation). It fails to discuss tubers/runners/bulbs/rhizomes which is a requirement for Excellence.	
3	M6	This response provides evidence towards M6 because it explains how the cotyledon contains energy that the seed can use during germination and favourable temperatures affect enzyme activity enabling them to work at the best possible rate. To reach Excellence, it needed to discuss how water helps activate enzymes in the food store converting starch into glucose or how oxygen is required for cell respiration in the cotyledon allowing energy to best released for germination/growth.	