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Level 3 Biology, 2017

91603 Demonstrate understanding of the responses of plants and animals to their external environment

9.30 a.m. Thursday 16 November 2017
Credits: Five

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of the responses of plants and animals to their external environment.	Demonstrate in-depth understanding of the responses of plants and animals to their external environment.	Demonstrate comprehensive understanding of the responses of plants and animals to their external environment.

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 room for any answer, use the extra space provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–12 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.

TOTAL

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QUESTION ONE

Mānuka seeds.
www.amazon.co.uk/Manuka-tree-leptospermum-scoparium-seeds/dp/B01BP3WCGA

Mānuka seeds germinating.
http://slideplayer.com/slide/5661375/

Mānuka seedlings after 2 months.
http://www.treeproject.org.au/seedling-database/leptospermum-scoparium

When the mānuka (*Leptospermum scoparium*) seed germinates below the soil surface, two different plant responses occur at the radical and plumule.

Mature mānuka trees release leptospermone, a chemical that acts as a natural herbicide.

Discuss how the different responses that the mānuka plant displays in germination and early growth are beneficial to the survival of the plant.

In your answer:

- identify and describe the two different responses shown by the mānuka seedling as it germinates below the soil
- explain the type of interaction between the mature mānuka and other plants growing nearby, due to the release of leptospermone into the soil
- explain how these responses occur below the soil as the mānuka germinates
- discuss the adaptive advantage of these two responses below the soil, and compare them with the response once the plumule is exposed to light.

You may use annotated diagrams as a part of your answer.

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QUESTION TWO

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http://www.nzbirdsonline.org.nz/species/sooty-shearwater http://www.teara.govt.nz/files/5484-enz_0.jpg

The sooty shearwater or mutton bird (*Puffinus griseus*) leaves New Zealand in the Southern Hemisphere's winter – summer in the Northern Hemisphere – and takes advantage of prevailing winds along different portions of their migration route.

When plotted on a map, their paths look like giant figure eights over the Pacific Ocean (see map above).

They are spectacular long-distance migrants, travelling north up the western sides of the Pacific and Atlantic Oceans at the end of the nesting season in March–May, reaching subarctic waters in June–July, where they cross from west to east, then returning south down the eastern sides of the oceans in September–October, reaching the breeding colonies in November. They do not migrate as a flock, but rather as single individuals, associating only opportunistically.

Recent tagging experiments have shown that birds breeding in New Zealand may travel 74 000 km in a year, reaching Japan, Alaska, and California, averaging more than 500 km per day.

Discuss why migration is important to the health and survival of the sooty shearwater.

In your answer:

- describe migration
- explain how the sooty shearwater might determine the time for migration, AND how they may navigate during migration
- discuss the costs and benefits of migration to the sooty shearwater.

There is more space for your answer to this question on the following pages.

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QUESTION THREE

http://howardcheek.photoshelter.com/image/I00005Pm3.HDRznI

http://cursa.ihmc.us/rid=1Q19NCQSR-1PH7VJX-2V1Q/flowering%20in%20plants.png

Mānuka (*Leptospermum scoparium*) are long-day plants which flower in spring and into summer. Flowering in the mānuka plant is controlled by the phytochrome system. The flowers are used by beekeepers to produce mānuka honey. Honeybees (*Apis mellifera*) seek their food within a circumference of 3 to 4 km around their hive. The bees navigate from the hive to the flowers using different cues during the day.

Relate the role of the phytochrome system to the survival of the mānuka plant population.

In your answer:

- identify and describe the relationship between the mānuka tree and the bees
- describe the process of photoperiodism AND explain how the phytochrome system could work in the mānuka tree
- discuss how photoperiodism in the mānuka tree provides an adaptive advantage to BOTH species.

You may use annotated diagrams to support your answer.

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There is more space for your answer to this question on the following page.

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Extra paper if required.
Write the question number(s) if applicable.

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