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NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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SUPERVISOR'S USE ONLY

# Level 3 Biology, 2013

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

2.00 pm Tuesday 12 November 2013
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 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.**

TOTAL

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You are advised to spend 60 minutes answering the questions in this booklet.

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## QUESTION ONE

The brown-headed cowbird, *Molothrus ater*, is found throughout the USA. Cowbirds follow herds of grazing animals, covering large distances daily, and feeding on insects. They are known as brood parasites because they lay their eggs in the nests of other birds.

Female cowbirds lay single eggs in host nests, abandoning them to the care of foster parents. On average up to 40 eggs are laid per breeding season. Cowbird chicks usually hatch sooner and grow faster than their hosts' chicks.

Cowbirds are believed to be a factor in the decline in numbers of songbirds across the USA.

*For copyright reasons, this resource cannot be reproduced here.*

Courting cowbirds, female (left) and male (right).

http://upload.wikimedia.org/wikipedia/commons/thumb/8/87/Cowbirdsincourtship.jpg/800px-Cowbirdsincourtship.jpg

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Eastern phoebe nest containing one egg from a brown-headed cowbird.

http://upload.wikimedia.org/wikipedia/commons/thumb/f/f9/Eastern_Phoebe-nest-Brown-headed-Cowbird-egg.jpg/800px-Eastern_Phoebe-nest-Brown-headed-Cowbird-egg.jpg

Discuss the effectiveness of the brown-headed cowbird's reproductive strategy and why it could be affecting the survival of songbirds across the USA.

In your answer you should:

- describe parasitism and the adaptive advantage it gives the brown-headed cowbird
- explain why the reproductive strategy works well for the brown-headed cowbird in its ecological niche
- justify why brown-headed cowbirds could be contributing to the decline of songbirds across the USA.

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## QUESTION TWO

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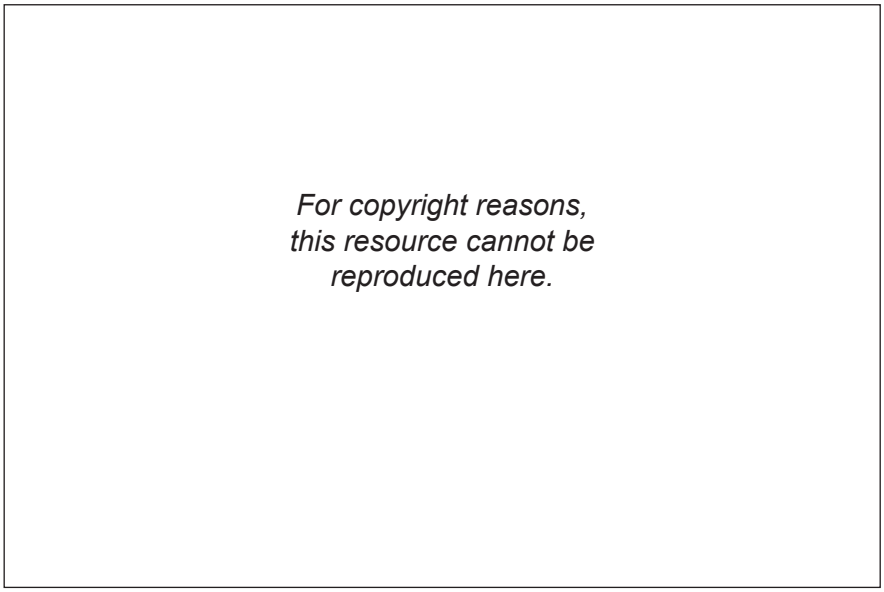
Flying squirrels nest in deep holes in trees, where they cannot see whether it is light or dark outside. They are nocturnal, becoming active between dusk and dawn.

Researchers monitored the activity of captured squirrels for 23 days under two sets of conditions: (a), a regular cycle of 12 hours of light and 12 hours of darkness, and (b), constant darkness.

The squirrels were given access to an exercise wheel and a rest cage. A recorder automatically noted when the wheel was rotating and when it was still.

The dark bars in the two actograms below indicate wheel-turning activity.




Campbell N. A., Reece J. B., *2008. Biology*, 7th ed. (San Francisco: Pearson/Benjamin Cummings, 2008), p 1031.

Analyse the findings from these actograms to explain how the responses shown above help the flying squirrel adapt to its ecological niche.

In your answer you should:

- describe the timing response or rhythm shown by the squirrel's activity in both actograms
- explain why the two sets of actograms are different and what they show about the pattern in the squirrel's behaviour over the twenty-three-day time period
- consider the adaptive advantages of this behaviour to the squirrel in relation to its ecological niche.

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## QUESTION THREE

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When a bean seed germinates, a combination of factors ensures that the shoot grows upwards and the root grows downwards, regardless of the way the seed has been planted.


Germination stages of a bean seedling.

D. G. Mackean, *Life Study: A Textbook of Biology* (London, John Murray, 1988)

Explain the roles of gravity, light, and auxin in the growth of a **shoot** from germination into a mature plant.

In your answer:

- describe the response of the shoot within its environment as it germinates AND as it continues to grow
- describe the role of auxin in shoot growth
- link the effects of gravity and light with the action of auxin through the different stages of shoot growth to maturity
- discuss any adaptive advantages the shoot gains from these responses, as it develops, in relation to its ecological niche.

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

QUESTION NUMBER

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