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NZQA
NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

For Supervisor's use only

Level 3 Biology, 2007

90716 Describe animal behaviour and plant responses in relation to environmental factors

Credits: Four
9.30 am Tuesday 27 November 2007

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 answer 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 2–10 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.

For Assessor's use only	**Achievement Criteria**	
Achievement	**Achievement with Merit**	**Achievement with Excellence**
Describe animal behaviour and plant responses in relation to environmental factors. ☐	Describe animal behaviour and plant responses in relation to environmental factors. ☐	Describe animal behaviour and plant responses in relation to environmental factors. ☐
	Explain animal behaviour or plant responses in relation to environmental factors. ☐	Discuss animal behaviour or plant responses in relation to environmental factors. ☐
Overall Level of Performance (all criteria within a column are met) ☐		

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You are advised to spend 40 minutes answering the questions in this booklet.

Assessor's use only

QUESTION ONE

Weta are nocturnal insects that emerge from holes in trees or from under bark soon after sunset, to forage for several hours on plant and animal material. They return to their resting places before dawn.

http://weta.boarsnest.net/coverpic.jpg

(a) Explain how this rhythmic behaviour is **controlled** in relation to seasonal changes throughout the year.

In a study of their rhythmic behaviour, weta were placed in **constant** conditions, and their activity was recorded for seven days. The data were then plotted on an actogram.

Assessor's use only

Double-plotted actogram of weta activity

R. D. Lewis (1999), 'Control models for the circadian clock of the NZ weta, *Hemideina thoracica*', *J. Biol. Rhythms* no 14, pp 480–485.

(b) Calculate the **period** for this rhythm. (Use the diagram in your calculation, and **show your working**.)

(c) Discuss the advantages **and** disadvantages of the weta's normal nocturnal behaviour, with respect to the weta's survival.

Assessor's use only

QUESTION TWO

Assessor's use only

Kalanchoe is a popular house plant with brightly coloured flowers. Flowering in *Kalanchoe* is controlled by the pigment phytochrome in response to photoperiod. To induce flowering, growers must ensure the plants are exposed to less than 11 hours of daylight each day.

(a) Describe this pattern of flowering.

(b) Explain how phytochrome controls flowering in *Kalanchoe*.

(c) Petal movement in *Kalanchoe* is a nastic response.

Explain the **difference** between a nastic response and a tropism, using responses in *Kalanchoe* as an example.

Kalanchoe has small flowers with petals that open and close in response to changes in turgor pressure within the petals (below).

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For copyright reasons, this resource cannot be reproduced here. Night (closed) Day (open) *Kalanchoe* flowers.	*For copyright reasons, this resource cannot be reproduced here.* Diurnal changes of *Kalanchoe* petal movement (grey) and turgor pressure (black) in the upper epidermis cells of the flowers.

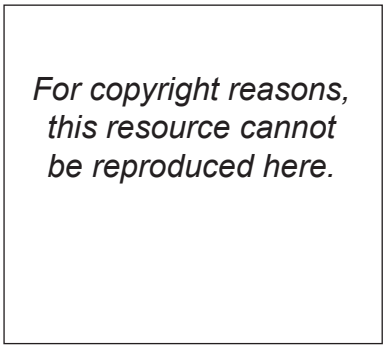
www.uni-tuebingen.de/plantphys/bioclox/books/engl/ren150205.pdf

(d) Discuss how this regular movement of the petals is produced by changes in turgor pressure, **and** how this movement enhances the plant's reproductive success.

QUESTION THREE

Assessor's use only

Psyllids are small insects (3–4 mm long) that feed by sucking plant sap. In New Zealand one species of psyllid lives on *Pittosporum* trees. Ants take honeydew from the psyllids and drive away other insects.



A juvenile psyllid.
http://ccpp.ucr.edu/news/Asian%20psyllid.html

(a) Describe the **relationship** between (i) psyllids and *Pittosporum*, **and** (ii) between psyllids and ants.

(i) psyllids and *Pittosporum*: _____

(ii) psyllids and ants: _____

(b) Describe ONE way in which *Pittosporum* plants could **benefit** from the relationship with ants and psyllids.

_____

_____

_____

(c) Describe the following interspecific relationships in terms of winners and losers, and give an example of each:

(i) **commensalism**

Description: _____

Example: _____

(ii) **parasitism**

Description: _____

Example: _____

(d) Interspecific competition is common in both plants and animals.

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Discuss how **interspecific competition** acts to control the population size of both species involved, in either plants or animals.
In your answer, consider:

- access to / availability of resources
- reproductive success
- maximum population size

and include New Zealand examples.

Extra paper for continuation of answers if required.
Clearly number the question.

Assessor's use only

Question number	

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