

SUPERVISOR'S USE ONLY

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Tirohia te uhi o muri e kitea ai te
whakapākehātanga o tēnei uhi

91603M



916035

Tuhia he (X) ki te pouaka mēnā
kāore koe i tuhi kōrero ki tēnei puka

☐

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Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Te Mātai Koiora, Kaupae 3, 2024

91603M Te whakaatu māramatanga ki ngā urupare a
ngā tipu me ngā kararehe ki te taiao

Ngā whiwhinga: E rima

Paetae	Kaiaka	Kairangi
Te whakaatu māramatanga ki ngā urupare a ngā tipu me ngā kararehe ki te taiao.	Te whakaatu māramatanga ki ngā urupare a ngā tipu me ngā kararehe ki te taiao, kia hōhonu.	Te whakaatu māramatanga ki ngā urupare a ngā tipu me ngā kararehe ki te taiao, kia tōtōpū.

Tirohia kia kitea ai e rite ana te Tau Ākonga ā-Motu (NSN) kei runga i tō puka
whakauru ki te tau kei runga i tēnei whārangi.

Me whakamātau koe i ngā tūmahi KATOAA kei roto i tēnei pukapuka.

Ki te hiahia wāhi atu anō koe mō ō tuhinga, whakamahia ngā whārangi wātea kei
muri o tēnei pukapuka.

Tirohia kia kitea ai e tika ana te raupapatanga o ngā whārangi 2-19 kei roto i tēnei pukapuka, ka mutu,
kāore tētahi o aua whārangi i te takoto kau.

Kaua e tuhi i ngā paenga (~~~~~). Ka poroa aua wāhanga ka mākahia ana te pukapuka.

HOATU TE PUKAPUKA NEI KI TE KAIWHAKAHAERE HEI TE MUTUNGA O TE WHAKAMĀTAUTAU.

TE TŪMAHI TUATAHI: Ngā hononga i te ngahere

Ka noho ngā pūpū-rangi (*Paryphanta spp.*) i te rōpū o ngā pūpū whenua nō te raki e nui ana, i kuneroa ai i Aotearoa i mua i te taenga mai o ngā konihi pō: ngā paihamu me ngā tuatete. Ka noho ngā pūpū i ngā wāhi e haumako ana te whenua, arā, e muia ana e te noke, ā, tērā pea ka 20 tau, ka nui ake rānei te roa o tana ora. Ka nui ake te puta haere o ngā pūpū i te pō. I ngā haora o te rā, he rite tonu te noho a te pūpū ki raro i te paparanga otaota, i ngā otaota rānei.

E ai ki te tātarihanga o ngā tūtae, i te nuinga o te wā, he noke, he pūpū iti hoki te kai a te pūpū, ā, ko ngā anga o ngā pūpū iti hei konupūmā mōna.

Ka whakaputa uri te nuinga o ngā pūpū i waenga i a Āperira me Hūrae, ā, i te āhua nei, ka tīmata i runga i ngā āhuatanga o te āhuarangi, pērā i te ua. Ko tōna 6 hua ka whānau mai i te pūpū-rangi, ka toru ngā wā whānau hua i ia tau. Ka tiakina ngā hua i te rua ka keria e ngā pūpū, i raro rānei i te paparanga otaota i te take o te rākau.

Pērā i ngā pūpū-rangi, ka putaputa hoki ngā tuatete (*Erinaceus europaeus*) i te pō; heoi, i ngā wāhi makariri, ka moe hōtoke ngā tuatete mō te ruarua marama i te tau, mehemea kei raro iho i te 11 putu tohuru te paemahana o te whenua. Ko te pūpū-rangi tētahi o ngā kai a te tuatete.

Ka kainga hoki te pūpū-rangi e ngā paihamu moeao (*Trichosurus vulpecula*), ā, i tā rātou noho i ngā rākau, ka māmā noa iho tā te paihamu kite i te tuaiwi-kore nui e āta haere ana.



He kātua pūpū-rangi.



He anga pūpū-rangi.



He tuatete e kai ana i te pūpū.



He paihamu.

QUESTION ONE: Relationships in the forest

Kauri snails / pūpū-rangi (*Paryphanta spp.*) belong to the group of northern giant land snails, which evolved in New Zealand before the introduction of the nocturnal predator species: possums and hedgehogs. The snails live in areas of fertile soil, rich with earthworms, and may live to 20 years or more. The snails are most active at night. They usually spend the day under leaf litter or vegetation.

Faecal analysis shows their diet is mainly earthworms and some small snails, with the small snails' shells being a source of dietary calcium.

Snail mating occurs mostly between April and July, and appears to be triggered by climatic conditions, such as rainfall. The kauri snail lays about six eggs, three times a year. The eggs are protected by a hole dug by the snails or under leaf litter at the base of a tree.

Like the kauri snails, hedgehogs (*Erinaceus europaeus*) are also active at night; however, in cold areas they can hibernate for a few months per year if the ground temperature is below 11 degrees Celsius. Their diet includes kauri snails.

Nocturnal brushtail possums (*Trichosurus vulpecula*) also eat kauri snails and, from a position in trees, they can spot the large invertebrate as it slowly moves along.



Adult pūpū-rangi.



Pūpū-rangi shell.



A hedgehog eating a snail.



Brushtail possum.

I tō tuhinga, me whai wāhi te matapakinga o:

In your answer, include discussion of:

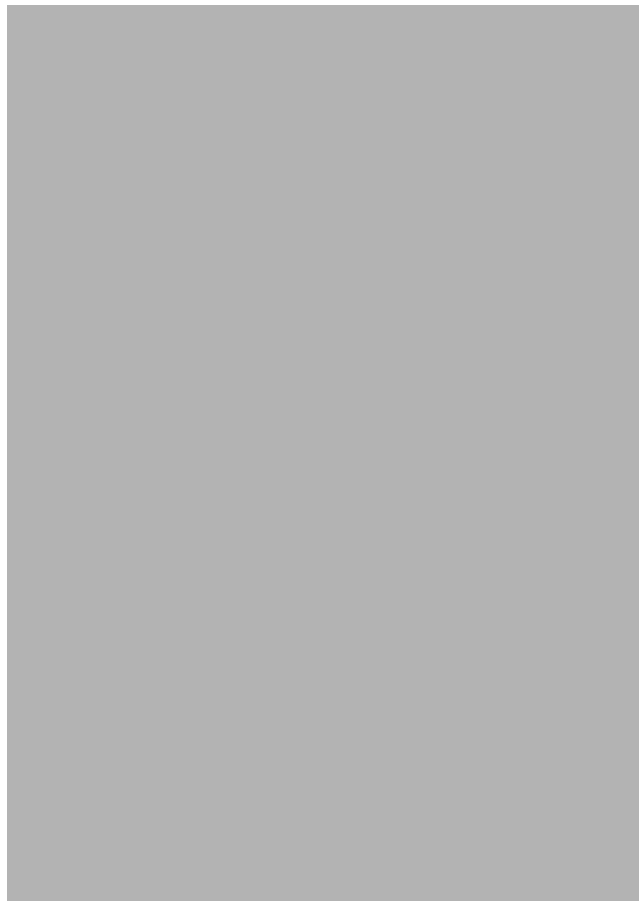
TE TŪMAHI TUARUA: Te pīrorohū me te kōwhai

He rākau māori te kōwhai (*Sophora spp.*) nō Aotearoa. Ka puāwai ngā putiputi mumura i te hiku o te hōtoke, i te upoko rānei o te kōanga. He mea nui ngā taiaki i ia wāhanga o te hurihanga ora, tae atu ki te whanaketanga o ngā pakiaka, ki te tupuranga me te puāwaitanga. Ka puāwai ana ōna putiputi, ka tae mai ngā kararehe, pērā i te pīrorohū (*Bombus terrestris*) ki te ruirui i te hae.

I Aotearoa, ka rapu kai te pīrorohū i te awatea, engari he nui kē atu āna mahi i ngā wā e makariri iho ana te rā. Ka noho hoki ngā pīrorohū i te Tiri o te Moana ki te Raki. I te raumati i te Tiri o te Moana ki te Raki, ka whiti mai te rā i ngā wā katoa. I rere tētahi whakamātautau i reira ki te āta titiro ki ngā whanonga rapu kai o tētahi kāhui pīrorohū i te rā e whiti ana i ngā wā katoa. Kei raro iho nei ngā kitenga mō ngā pīrorohū i Te hoahoa 1.



Tētahi pīrorohū e rapu kai ana i tētahi pua kōwhai.



Te hoahoa 1: He kauwhata korikori takirua e whakaatu ana i ngā wā rapu kai o ngā pīrorohū e rua nō tētahi kāhui, i te rā e whiti ana i ngā wā katoa.

Matapakina te āhua o te whakahaere i ngā tukanga oranga mā roto mai i te wā ā-koiora e angitu ai te kōwhai.

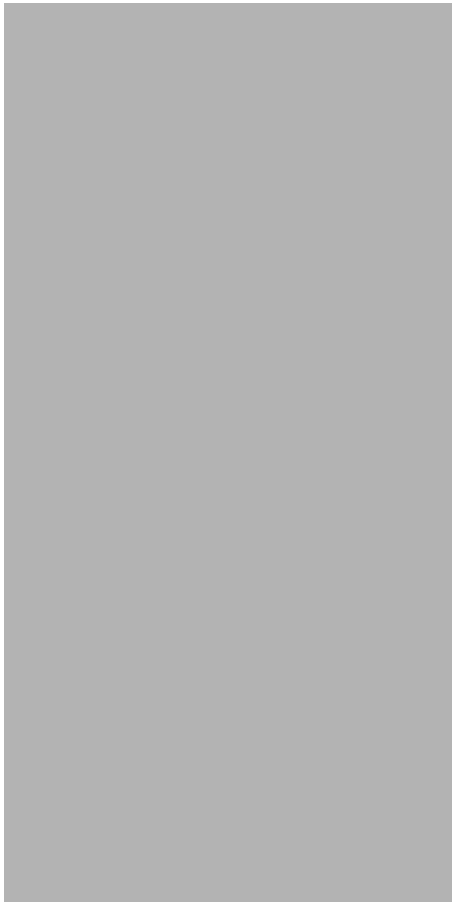
I tō tuhinga, me whai wāhi te matapakinga o:

- te āhua o te kōwhai hei rākau rā-roa, hei rākau rā-poto rānei, me ētahi taunakitanga
- te tukanga o tā ngā pihi kōwhai urupare ki te tō ā-papa
- te momo o te urupare ā-nekehanga a te pīrorohū ki te waihonga kōwhai
- te āhua o te hāngai o te wā ā-koiora o te pīrorohū i Aotearoa, o te kōwhai hoki ki ngā āhuatanga o te taiao.

QUESTION TWO: Bumblebees and kōwhai

The kōwhai (*Sophora spp.*) is a New Zealand native tree. The brightly coloured flowers bloom in late winter or early spring. Auxins are essential at each stage in the life cycle, including root development, growth, and flowering. Once the plant flowers, pollination occurs via animals such as the bumblebee (*Bombus terrestris*).

In New Zealand, the bumblebee forages for food during daylight hours, but is more active in the cooler times of the day. Bumblebees also live in the Arctic. During the Arctic summer, there is constant 24-hour daylight. An experiment was conducted in the Arctic to observe the foraging behaviour of a bumblebee colony under constant light conditions. Results for two bumblebees are shown in Figure 1 below.



A bumblebee foraging in kōwhai blossom.

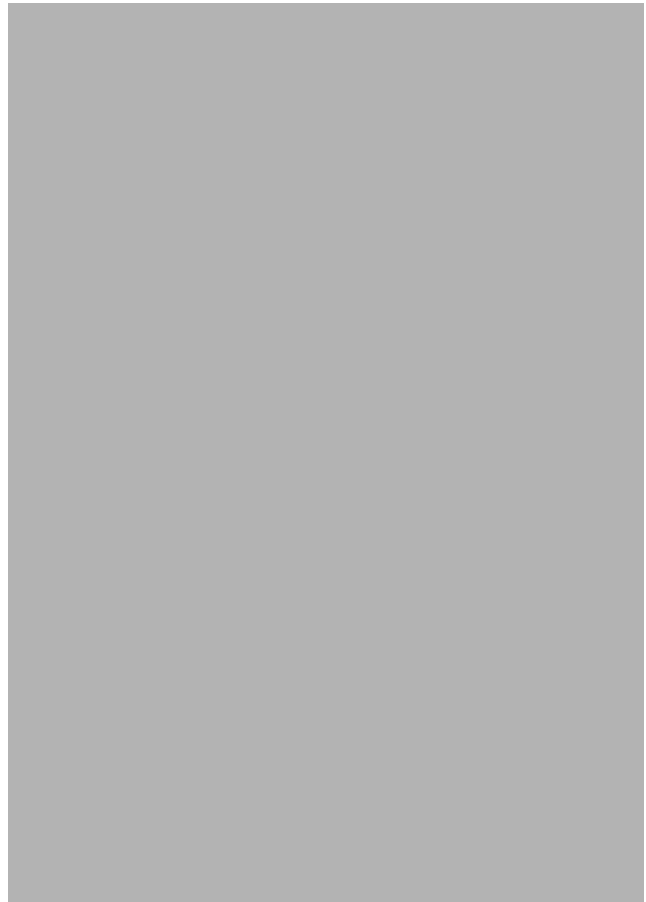


Figure 1: Double-plotted actograms showing foraging times of two individual worker bees from a colony under constant light conditions.

Discuss how the control of life processes through biological clocks results in kōwhai success.

In your answer, include discussion of:

- whether the kōwhai is a long-day plant or a short-day plant, including evidence
- the mechanism for the geotropic response of the kōwhai shoots
- the type of movement response of the bumblebee to the kōwhai nectar
- whether the New Zealand bumblebee and the kōwhai have biological clocks that are entrained to environmental factors.

TE TŪMAHI TUATORU: Te whakatupu tahi

E rongonui ana ngā manu rae-ura nō Ahitereiria (*Pomatostomus ruficeps*) mō ō rātou whanonga pāpori. Ko tōna 25 manu ka noho tahi hei kāhui, e mahi tahi ana i ētahi momo mahi, pērā i te horoi ā-puehu, i te whakaene, i te kai hoki. Ka rapu tahi te kāhui i te kai, tae atu ki ngā ngārara, ki ngā pūngāwerewere, ki ngā ika oneone iti, ki ngā mawhiti me ngā moko, waihoki ngā huarākau me ngā kākano i ngā otaota.

I te pō, ka kōpā te noho i tētahi kōhanga pokapū e rahi ana, ā, ka ohore ana, ka piri tahi pea ngā manu ki raro i te ururua o ngā rau, ka rere rānei ki ngā rākau kei raro i te kāuru o te ngahere, kaha ketekete ai.

I te nuinga o te wā, i waenga i a Hūrae me Noema ka rere ngā mahi o te whakatupu, e puta ai he kohinga hua kotahi e nui ana (arā, he maha ngā hua) i ngā takirua whakatupu katoa.

Ka mahi tahi te kāhui katoa ki te hanga i te kōhanga kotahi, ki te whāngai i ngā uwaha e noho ana ki ngā hua, ki te wawao hoki i te rohe whakatupu. Me uaua ka whai ētahi ki te whakatupu me te kore i tautokona e te kāhui. Kua whakaūhia e ngā kairangahau, kei te takiwā o te 4 ngā toa whakatupu, engari ka eke pea ki te 12 ngā toa whakatupu-kore hei kaiāwhina. He mea nui te hononga ā-whakapapa, i te āhua nei, nā te mea kāore ngā uwaha mō te tiaki i ngā pīpī nā manu kē atu.



He kātua manu korokī.



He manu korokī me te ngārara kua mau i a ia.



He mahi whakahoahoa te manu korokī.



He manu korokī kei te puta i tōna kōhanga.

Mātaihia te āhua o te wāhi ki te whanonga pāpori e hua ai te angitu o te whakatupu i ōna wā.

I tō tuhinga, me whai wāhi te matapakinga o:

- ngā kupu pēnei i te takiwā me te hononga ā-whakapapa, me ngā tautuhinga hoki o aua kupu
- tētahi huanga o tā tētahi kāhui mahi tahi ki te rapu kai, ki te whakaene hoki i tēnā, i tēnā
- te take e tautoko ai ngā toa kaiāwhina maha ake i te taupori, me te take kāore ngā uwaha mō te tautoko i te tiakanga me te whanaketanga o te pīpī.

QUESTION THREE: Cooperative breeding

Australian chestnut-crowned babbblers (*Pomatostomus ruficeps*) are known for their social behaviour. They live in groups of up to approximately 25 individuals and participate in activities such as dust bathing, preening, and feeding. Together, they look for food, including insects, spiders, small amphibians, crustaceans, and reptiles, as well as fruit and seeds from plants.

At night, they crowd together in one large, central nest and, when alarmed, they may huddle together under dense foliage or fly up into the under-canopy of trees and shrubs, chattering noisily.

Breeding usually occurs between July and November with a single, large clutch of eggs (i.e. many eggs) from all the breeding pairs.

The entire group helps to build the one nest, feed the incubating females, and defend the breeding territory. Reproduction without support is rarely attempted. Researchers confirm there are often about 4 breeding males but up to 12 non-breeding, helper-males. Kin selection appears to be important, as females will not support the care and development of young with which they have no genetic relationship.



Adult babbler.



A babbler with an insect it has caught.



Babblers are social in their behaviour.



A babbler coming off its nest.

Examine how social behaviour can lead to successful reproduction.

In your answer, include discussion of:

- the terms territory and kin selection, including definitions
- an advantage of a group being involved in finding food together and of preening each other
- why the larger number of helper-males supports the population, and why the non-related females do not support the care and development of the young.

**He whārangi anō ki te hiahiatia.
Tuhia te tau tūmahi mēnā e hāngai ana.**

TE TAU
TŪMAHI

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

**He whārangi anō ki te hiahiatia.
Tuhia te tau tūmahi mēnā e hāngai ana.**

TE TAU
TŪMAHI

Ngā Mihi

He mea whakahāngai ngā kōrero i ngā mā tāpuna e whai ake nei hei whakamahinga i tēnei aromatawai:

Te whārangi 2

<https://www.pfk.org.nz/post/kauri-friends-kauri-snail>
<https://www.inaturalist.org/taxa/108955-Paryphanta-busbyi>
<https://www.pestsbanned.com/snails/do-hedgehogs-eat-snails/>
<https://www.eurekalert.org/news-releases/533215>

Te whārangi 8

<https://www.nzgeo.com/stories/kowhai/>
<https://bmcbiol.biomedcentral.com/articles/10.1186/1741-7007-8-93>

Te whārangi 12

<https://ebird.org/species/chcbab2>
<https://mdahlem.net/birds/19/chcrbab.php> (ngā whakaahua 2–4)

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

QUESTION
NUMBER

Acknowledgements

Material from the following sources has been adapted for use in this assessment:

Page 3

<https://www.pfk.org.nz/post/kauri-friends-kauri-snail>
<https://www.inaturalist.org/taxa/108955-Paryphanta-busbyi>
<https://www.pestsbanned.com/snails/do-hedgehogs-eat-snails/>
<https://www.eurekalert.org/news-releases/533215>

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<https://www.nzgeo.com/stories/kowhai/>
<https://bmcbiol.biomedcentral.com/articles/10.1186/1741-7007-8-93>

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<https://ebird.org/species/chcbab2>
<https://mdahlem.net/birds/19/chcrbab.php> (images 2–4)

English translation of the wording on the front cover

Level 3 Biology 2024

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

Credits: Five

91603M

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.

Check that this booklet has pages 2–19 in the correct order and that none of these pages is blank.

Do not write in the margins (// // // //). This area will be cut off when the booklet is marked.

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