91603M

916035

NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

QUALIFY FOR THE FUTURE WORLD
KIA NOHO TAKATŪ KI TŌ ĀMUA AO!

3

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Koiora, Kaupae 3, 2018

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

2.00 i te ahiahi Rāhina 19 Whiringa-ā-rangi 2018
Whiwhinga: Rima

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

Tirohia mēnā 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 KATOA kei roto i tēnei pukapuka.

Mēnā ka hiahia whārangi atu anō koe mō ō tuhinga, whakamahia ngā whārangi wātea kei muri o tēnei pukapuka, ka āta tohu ai i te tau tūmahi.

Tirohia mēnā e tika ana te raupapatanga o ngā whārangi 2–23 kei roto i tēnei pukapuka, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

ME HOATU RAWA KOE I TĒNEI PUKAPUKA KI TE KAIWHAKAHAERE Ā TE MUTUNGA O TE WHAKAMĀTAUTAU.

TAPEKE

MĀ TE KAIMĀKA ANAKE

TŪMAHI TUATAHI

Hoahoa 1: Ngā tōihi o te puawānanga (*Clematis forsteri)*
https://goo.gl/9f9PWH

Hoahoa 2: Ngā tōihi o te puawānanga (*Clematis forsteri)*
https://goo.gl/GXTchY

Hoahoa 3: Tipu tairongo (*Mimosa pudica)* me ngā rau iti huaki
https://goo.gl/5XZnyN

Hoahoa 4: Tipu tairongo (*Mimosa pudica)* me ngā rau iti kati
https://goo.gl/N6S5Uy

Ka puta i ngā tipu ngā urupare ā-ahunga tauwhāiti e pai ake ai te urutau kia ora ai i roto i tētahi wāhi noho. He maha ngā tipu e mōhiotia ana mō te whakaputa i ngā hanganga angiangi āhua rite ki te aho e kīia ana he tōihi, e whakaaturia ana ki ngā Hoahoa 1 me te 2 o te puawānanga (*Clematis forsteri)*, he aka tautini taketake o Aotearoa, hei uruparenga ki te pā ki tētahi hanga tautoko. He rerekē te urupare a ētahi atu tipu ki te whakaaraara pā. Ko te *Mimosa pudica* he tipu tairongo pērā anō ka tere kati i ana rau i te pānga atu, i te rurenga rānei. E whakaatu ana ngā Hoahoa 3 me te 4 i te āhua o te huaki o ngā rau, ā, ka kati i te pānga atu.

Matapakitia ēnei urupare e rua, ngā painga urutau mō ngā tipu e whakaatu ana i aua urupare, ā, me te urupare ake a ia tipu ki te whakaaraara pā.

I tō tuhinga, me:

- tautohu me te āta whakaahua i ngā urupare koiora e rua ki te whakaara pā
- whakamārama mai he pēhea te mahi a ngā tukanga i ia urupare, me te parahau he aha i kīia ai ēnei urupare he painga urutau
- whakataurite ngā painga urutau ka whiwhi ēnei tipu i roto i te nōhanga mā te whakaatu i ēnei urupare.

QUESTION ONE

Figure 1: Tendrils of *Clematis forsteri*
https://goo.gl/9f9PWH

Figure 2: Tendrils of *Clematis forsteri*
https://goo.gl/GXTchY

Figure 3: Touch-me-not plant with open leaflets
https://goo.gl/5XZnyN

Figure 4: Touch-me-not plant with closed leaflets
https://goo.gl/N6S5Uy

Plants exhibit specific orientation responses that provide adaptive advantages to their survival in a given habitat. Many plant species are known to produce slender spring- or thread-like structures called tendrils, as shown in Figures 1 and 2 of *Clematis forsteri*, a New Zealand native woody perennial climber, in response to touching a support. Yet other plants exhibit different responses to the touch stimuli. The *Mimosa pudica*, or touch-me-not plant, is one such plant that closes its leaflets rapidly when suddenly touched or shaken. Figures 3 and 4 depict how the leaflets are open, and then close on being touched.

Discuss these two responses, the adaptive advantages gained for the plants that display them, and how each plant has such a specific response to the touch stimulus.

In your answer:

- identify and fully describe both biological responses to the touch stimulus
- explain how the processes occur in each response, and justify why these responses are considered adaptive advantages
- compare the adaptive advantages the plants gain in their habitat by displaying these responses.

MĀ TE KAIMĀKA ANAKE

He wāhi anō mō tō tuhinga mō tēnei tūmahi kei ngā whārangi o muri mai.

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

MĀ TE KAIMĀKA ANAKE

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TŪMAHI TUARUA

MĀ TE KAIMĀKA ANAKE

He **wāpu** te *Aphidius ervi* (*A. ervi*) e whakawhānau ana i ana hua i roto i te tinana o ngā **ngō**[1]. Tata ki te 150–350 katoa ngā hua ka whakawhānautia e te uwha o te *A. ervi* i tōna oranga. He pango te *A. ervi*, ā, he 4–5 mm te roa. He rite te āhua o ngā wāpu katua ki ngā pōpokoriki whai parirau.

He ngārara ngote wairākau tino iti rawa ngā ngō. E tino kitea ana ēnei i runga rōhi, me ngā huanga kai pērā i te otahua, rapikama, taewa hoki. Ko te ora toharite o te ngō he kotahi marama.

Kāore noa e pau ētahi hēkona ka whakawhānau hua te uwha katua o te *A. ervi* ki roto i te ngō. Ka nekeneke, ka kai haere tonu te ngō i muri i te whakawhānautanga atu o te hua. Ka tipu te torongū i roto i te tinana o te ngō, ā, e kīia ana i tēnei wāhanga he "mami" (mummy). He rite te mami ki tētahi ngō rauwhero mōmona rawa. Kātahi ka ngaungau haere *A. ervi* i tētahi puare i muri o te mami kia puta ai hei wāpu katua, ka whakamate i te ngō, ā, kua wātea ki te whakawhānau hua ki roto i ngā ngō ora.

He Ervi e whakawhānau ana i ngā hua ki roto i te ngō.

www.biocomes.eu/biological-control/biological-control-examples/

E whakaatu ana ngā kauwhata kei te whārangi 10 i te manakohanga o te *A. ervi* ki te (1) Pakeke o ngā ngō me te (2) Tau toharite o ngā hua e whakawhānautia ana e ia uwha o te *A. ervi* e ai ki te pakeke o te ngō.

[1] weo

QUESTION TWO

ASSESSOR'S USE ONLY

Aphidius ervi (*A. ervi*) are **wasps** that lay their eggs inside the body of **aphids**. A female *A. ervi* lays around 150–350 eggs in a lifetime. *A. ervi* are black and about 4–5 mm long. The adult wasps resemble small winged ants.

Aphids are tiny sap-sucking insects, commonly called greenflies. They are commonly found on roses, and on crop plants such as eggplants, capsicums, and potatoes. The average life-span of an aphid is one month.

The adult female *A. ervi* deposits an egg into the aphid in a matter of seconds. The aphid continues to move and feed after the egg has been deposited. The larva develops within the aphid body which at this stage is called a "mummy". The mummy looks like an over-inflated bronze aphid. *A. ervi* then chews a hole through the back of the mummy and emerges as an adult wasp, killing the aphid, and is now ready to deposit eggs in live aphids.

Ervi depositing eggs into aphid.

www.biocomes.eu/biological-control/biological-control-examples/

The graphs on page 11 show the preference of *A. ervi* to (1) Age of the aphids and (2) Mean number of eggs laid per *A. ervi* female in relation to the age of the aphid.

MĀ TE KAIMĀKA ANAKE

Kauwhata 1: Tau toharite o ngā ngō e whakamahia ana mō te whakawhānau hua mō ia uwha o te *A. ervi* e ai ki te pakeke o te ngō

Kauwhata 2: Tau toharite o ngā hua ka whakawhānautia ki roto i ngā ngō mō ia uwha o te *A. ervi* (kua whakatau tatatia mai i te tīpokatanga) e ai ki te pakeke o te ngō

He mea urutau nō Du, Y., Poppy, G.M., Powell, W. et al., *J Chem Ecol*, Vol 24 (1998), wh. 1355.

Arotakehia, mā te whakamahi i ngā mōhiohio i runga ake, ngā utu me ngā painga o ngā pātahitanga i waenga i ngā rauropi e toru.

I tō tuhinga, me:

- tautohu ngā pātahitanga i waenga i ngā wāpu *A. ervi* me ngā ngō, i waenga hoki i ngā ngō me ngā tipu rōhi / huanga kai
- arotake ngā utu me ngā painga i roto i ngā pātahitanga i runga ake i waenga i ngā ngō, ngā wāpu *A. ervi*, me ngā rōhi, ngā tipu huanga kai rānei
- tātari ngā kauwhata i runga ake me te tuku whakatau mō te hurihanga ora o ngā wāpu *A. ervi* me ngā ngō, me te pānga ki ngā rōhi me ngā tipu huanga kai.

He wāhi anō mō tō tuhinga mō tēnei tūmahi kei ngā whārangi o muri mai.

ASSESSOR'S USE ONLY

Graph 1: Mean number of aphids used for egg laying per *A. ervi* female in relation to aphid age

Graph 2: Mean number of eggs laid in aphids per *A. ervi* female (estimated from dissection) in relation to aphid age

Adapted from Du, Y., Poppy, G.M., Powell, W. et al., *J Chem Ecol*, Vol 24 (1998), p. 1355.

Evaluate, using the information above, the costs and benefits of the relationships between the three organisms.

In your answer:

- identify the relationships between the *A. ervi* wasps and the aphids, and between the aphids and the rose / crop plants
- evaluate the costs and benefits in the above relationships between the aphids, *A. ervi* wasps, and rose or crop plants
- analyse the graphs above and draw conclusions on the lifecycles of the *A. ervi* wasps and aphids, and the impact on rose and crop plants.

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

MĀ TE KAIMĀKA ANAKE

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MĀ TE KAIMĀKA ANAKE

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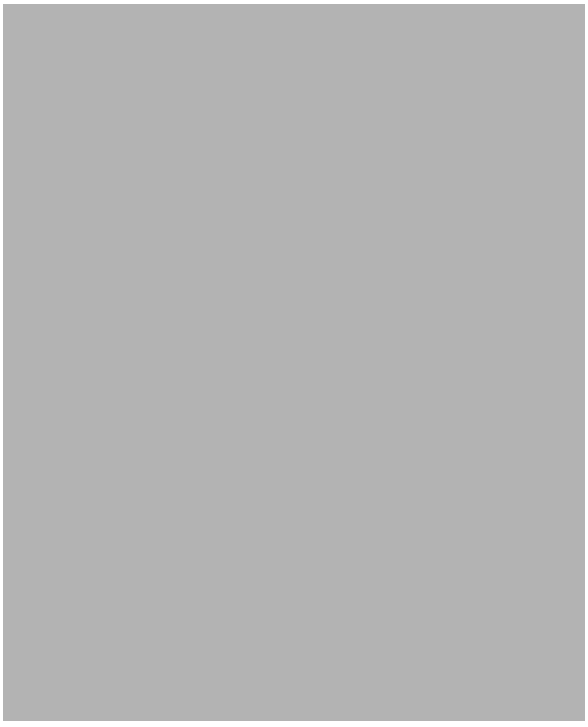
TŪMAHI TUATORU

MĀ TE KAIMĀKA ANAKE

He kiore iti te *Mus musculus* e kitea noatia ana i roto i ngā kāinga, ā, i roto hoki i ngā wāhi ururākau[1] katoa o Aotearoa. He kai i ngā hua, kākano, me ngā ngārara, ā, ka itiiti ake te rahinga o ēnei kai e wātea ana ki ngā manu taketake me ētahi atu whāngote e noho whenua ana. Ka kainga hoki e aua kiore ngā hua o te inanga, *Galaxias maculatus*, he ika māori nō Aotearoa.

I ia rua tau, toru tau rānei, matomato ana ngā hua kākano o te tawai, e nui ai te rato kai mā ngā kiore. Nā tēnei ka nui whakaharahara te tipu mai o ngā kiore. Ka kainga e ngā toriura ngā kiore, kātahi ka nui haere atu te maha o ngā toriura i te nui haerenga atu o ngā kiore. I roto i ngā marama whai ake, ina tinaku ana ngā kākano tawai, ā, kua itiiti haere te maha o ngā kiore, kātahi ka huri ngā toriura ki te kai i ngā manu taketake.

I āta tirotirohia e ngā kairangahau ngā kiore i hopukia mō te 37 rā. Ko ngā mahinga e whakaaturia ana i raro he **hoahoa mahinga** o ngā kiore i te 24 haora i **ngā āhuatanga taiao noa** mō **ngā rā 17 tuatahi** e tohua ana e te Mārama me te Pōuri (**LD**). I muri mai, e 24 haora te roa e haere ana ngā kiore i roto i te **pōuri motukore**, ā, e tohua ana tēnei e te **DD** mō ngā rā 20 e whai ake.



He mea urutau i Nicolas Cermakian, Lucia Monaco, Matthew P. Pando, Andrée Dierich, Paolo Sassone-Corsi, 'Altered behavioral rhythms and clock gene expression in mice with a targeted mutation in the *Period1* gene', *EMBO Journal*, 2001, Vol 20, No 15, wh. 3967–3974.

Tātarihia ngā kitenga mai i tēnei hoahoa mahinga hei whakamārama he pēhea ngā urupare i runga ake e āwhina ai i ngā kiore kia urutau ki te tūranga haupori, Ā, he pēhea te pānga o tēnei ki te taiao.

I tō tuhinga, me:

- whakaahua te urupare wā me te manawataki e whakaaturia ana e ngā kiore e pā ana ki ngā hoahoa mahinga
- whakamārama he pēhea te whakahaere i tēnei manawataki
- arotake ngā painga urutau o te manawataki noa me te tikanga whakahaere mō ngā kiore, me ngā mutunga iho ki te taiao.

[1] puihi

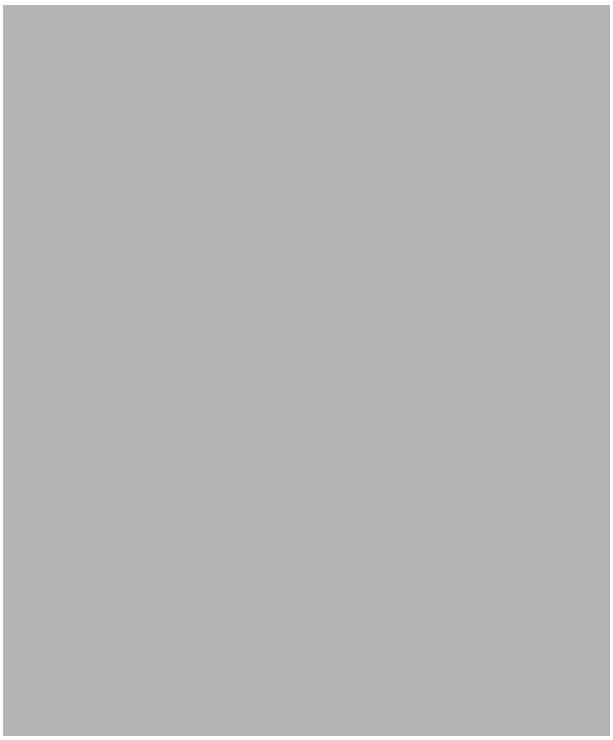
QUESTION THREE

ASSESSOR'S USE ONLY

Mus musculus, commonly known as the house mouse, is found abundantly in all bush areas of New Zealand. It feeds on berries, seeds, and insects, reducing the amount of these foods available to native birds and other ground-dwelling mammals. The mice are also known to eat the eggs of a species of native fish, the inanga, *Galaxias maculatus,* commonly called whitebait in New Zealand.

Every two or three years beech trees flourish to produce heavy seed crops, supplying the mice with a huge source of food. The mouse numbers therefore surge in response to this. As stoats feed on mice, the numbers of stoats increase along with the increased mouse numbers. In the following months, once the beech seeds have germinated and mouse numbers have dropped, the stoats turn their predatory attention to native birds.

Researchers monitored the activity of captured mice for 37 days. The activity shown below is an **actogram** of the mice in a 24-hour period in **normal environmental conditions** for the **first 17 days** indicated by Light and Dark (**LD**). Thereafter, the mice are subjected to 24 hours of **continuous darkness** indicated by **DD** for the next 20 days.



Adapted from Nicolas Cermakian, Lucia Monaco, Matthew P. Pando, Andrée Dierich, Paolo Sassone-Corsi, 'Altered behavioral rhythms and clock gene expression in mice with a targeted mutation in the *Period1* gene', *EMBO Journal*, 2001, Vol 20, No 15, pp. 3967–3974.

Analyse the findings from this actogram to explain how the responses shown above help the mice to adapt to their ecological niche AND how this may impact on the environment.

In your answer:

- describe the timing response and rhythm shown by the mice in relation to the actograms
- explain how this rhythm is controlled
- evaluate the adaptive advantages that the normal rhythm and control mechanism have for the mice, and the consequences to the environment.

MĀ TE KAIMĀKA ANAKE

He wāhi anō mō tō tuhinga mō tēnei tūmahi kei ngā whārangi o muri mai.

ASSESSOR'S USE ONLY

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

He whārangi anō ki te hiahiatia.
Tuhia te (ngā) tau tūmahi mēnā e tika ana.

TAU TŪMAHI

MĀ TE KAIMĀKA ANAKE

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

QUESTION NUMBER

ASSESSOR'S USE ONLY

He whārangi anō ki te hiahiatia.
Tuhia te (ngā) tau tūmahi mēnā e tika ana.

TAU TŪMAHI

MĀ TE KAIMĀKA ANAKE

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

QUESTION NUMBER

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English translation of the wording on the front cover

Level 3 Biology, 2018

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

2.00 p.m. Monday 19 November 2018
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 and clearly number the question.

Check that this booklet has pages 2–23 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.