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91605M

916055

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

Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Te Mātai Koiora, Kaupae 3, 2023

91605M Te whakaatu māramatanga ki ngā tukanga o te kukuwhatanga e puta ai te whakamomotanga

Ngā whiwhinga: E whā

Paetae	Kaiaka	Kairangi
Te whakaatu māramatanga ki ngā tukanga o te kukuwhatanga e puta ai te whakamomotanga.	Te whakaatu māramatanga ki ngā tukanga o te kukuwhatanga e puta ai te whakamomotanga, kia hōhonu.	Te whakaatu māramatanga ki ngā tukanga o te kukuwhatanga e puta ai te whakamomotanga, 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 KATOA 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 ki tētahi wāhi e kitea ai te kauruku whakahāngai (). Ka poroa taua wāhi ka mākahia ana te pukapuka.

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

TE TŪMAHI TUATAHI: TE KANORAUTANGA Ā-IRA

He kākā rerekore te kākāpō e taketake ana i Aotearoa. Ka kitea whānuitia te kākāpō i mua, heoi kei tōna 250 noa iho ngā manu e toe ana i ēnei rā, ā, ka heke mai te nuinga i te mātāira nō tētahi motu tūhāhā.

E ai ki te ariā nuku ira, kāore e kore ka tāpiripiripirihia he irakē kino i tētahi taupori iti. Kua whakaaturia e ngā tātaritanga o te pānga o te taupori iti mō te wā roa, he iti iho ngā irakē kino i ngā kākāpō e noho ana ki te motu i tēnei rā, ina whakatairitea ki ngā kākāpō e noho ana ki tuawhenua. Tērā pea he hua tēnei nō te whiringa māori, e haukotia ai te heke o ngā irakē kino.

Matapakina ngā āhuatanga o te kukuwhatanga o te kākāpō, ā, honoa aua āhuatanga ki te anamata o ngā taupori.

I tō tuhinga, me kōrero mō:

- ngā kupu nei, mō te irakē me te mātāira, me whai tautuhinga hoki
- te wāhi ki te whakaawenga motuhake i kaha ake ai te putanga o te nuku ira i te momo kākāpō
- ngā pānga o te nuku ira me te whiringa māori ka puta pea ki te oranga tonutanga o tēnei momo.

He wāhi anō mō tō tuhinga mō tēnei tūmahi kei te whārangi e whai ake nei.

QUESTION ONE: GENETIC DIVERSITY

The kākāpō is a flightless parrot, endemic to New Zealand. Once common, approximately 250 individuals are all that remain today, most of them descended from an isolated island gene pool.

Genetic drift theory suggests that a small population is likely to have accumulated harmful mutations. Analyses on the impact of the long-term, small population size shows that the present-day island kākāpō have a smaller number of harmful mutations when compared to mainland kākāpō. This is possibly due to natural selection, where harmful mutations are selected out.

Discuss aspects of kākāpō evolution and link these to the future of the populations.

In your answer, include discussion of:

- the terms mutation and gene pool, including definitions
- how the founder effect enables genetic drift to be more apparent in the kākāpō species
- how genetic drift and natural selection may have implications for the survival of the species.

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

TE TŪMAHI TUARUA: MINGIMINGI

He kāhui tipu puāwai te mingimingi *(Coprosma)*, kei tōna 90 ōna momo. I tipu tuatahi mai ngā mingimingi *(Coprosma)* i Aotearoa i kō atu i te 25 miriona tau ki muri, engari ināianei ka kitea i Hawai'i, i Ahitereiria me Tāhimania, i Pōnio, i Hawa, i Niu Kini, me ngā motu o Te Moana Nui a Kiwa.

He iti, he māotaota hoki ngā rau, ā, he kakara kōhure ka puta mai ina kōnatunatuhia. Ka tipu i ngā nōhanga rerekē e whānui ana, i ngā tāhuahua ki ngā maunga, ā, e whakaatahia ana te rerekētanga o ngā āhua o te momo i ngā wāhi rerekē o Aotearoa me Te Moana Nui a Kiwa.

He mauwha ētahi, he mauwha whito ētahi (he mārō, he poto hoki), he rākau ētahi e 7.5 m te teitei, ā, he whāriki te āhua o ētahi atu.

Taupata *Karamū* *Tātaraheke*

Matapakina te mahoratanga urutau i ngā mingimingi (*Coprosma)*.

I tō tuhinga, me kōrero mō:

- te mahoratanga urutau me te tūranga, me whai tautuhinga hoki
- te wāhi ki ngā nōhanga rerekē i te mahoratanga urutau o ngā mingimingi (*Coprosma)*
- te take e rerekē ana pea ngā āhuatanga o ngā mingimingi (*Coprosma)* e tipu ana i ngā motu rerekē, ā, e taea ana hoki te kī he momo rerekē.

He wāhi anō mō tō tuhinga mō tēnei tūmahi kei ngā whārangi e whai ake nei.

QUESTION TWO: COPROSMA

Coprosma (mingimingi) are a group of approximately 90 species of flowering plants. *Coprosma* originated in New Zealand more than 25 million years ago but are now found in Hawaii, Australia and Tasmania, Borneo, Java, New Guinea, and islands of the Pacific.

They have small, evergreen leaves, which give off a distinctive smell when crushed. They grow in a wide range of habitats, from sand dunes to mountains, with the variety of forms in the genus reflecting the diverse landscapes of New Zealand and the Pacific.

Some are shrubs, some are subshrubs (woody and short), some are trees growing up to 7.5 m tall, and others are more mat-like.

Coprosma repens

Coprosma ochracea

Coprosma acerosa

Discuss adaptive radiation in *Coprosma*.

In your answer, include discussion of:

- adaptive radiation and niche, including definitions
- how different habitats have led to adaptive radiation of *Coprosma*
- why *Coprosma* growing on different islands might have different appearances and can be classed as different species.

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

TE TŪMAHI TUATORU: TE NGĀOKEOKE – TE NOKE MŌNEHU

Ahakoa kei te takiwā o te 200 ngā momo noke mōnehu i te ao, ko tōna 30 kei Aotearoa. O aua momo e 30, e 9 anake ngā momo kua āta tautohua, kua mātaitia hoki. E matapaetia ana, mehemea ka kaha ake te rangahaua o te pītau ira, ka whakaahuatia ētahi momo hou.

Ka whakarōpūtia ngā ngāokeoke ki ngā puninga e rua. He hua-pao-roto *(ovoviviparous)* te *Peripatoides*, arā, ka whānau ngā kūao i te paotanga o ngā hua i roto tonu i te uwha. He hua-pao-waho *(oviparous)* te *Ooperipatellus*, arā, ka whānau mai ngā hua i ngā uwha, ā, nāwai ka paopao. Ka kitea ngā ngāokeoke whānau-hua i Aotearoa me Ahitereiria anake. Ka kaha ake te kitea o ngā noke whānau-hua i ngā wāhi makariri ake, i ngā wāhi takiraha ake, i ngā wāhi teitei hoki, hei tauira, ko te momo i Haupapa *(Tasman Glacier)* tētahi. Ka noho ngā noke whānau-kūao i ngā wāhi mahana, i ngā wāhi kōpani ake, i ngā wāhi hakahaka ake anō hoki.

Peripatoides tūāuri

Te kūao, kua pao ki roto, kātahi ka whānau mai

Te kātua me te kūao

Peripatoides novaezealandiae

Matapakina ngā āhuatanga o te kukuwhatanga o ngā noke mōnehu.

I tō tuhinga, me kōrero mō:

- te whakamomotanga noho wehe *(allopatric speciation)* me te whakamomotanga noho tahi *(sympatric speciation)*, me whai tautuhinga hoki
- te wāhi ki ngā tukanga ā-nuku e piki haere ai pea te whakamomotanga i ngā noke mōnehu o Aotearoa
- te take ka puta pea ētahi momo hou i te mātaitanga o te pītau ira
- te wāhi ki ngā tikanga noho tūhāhā mō te whakaputa ira *(RIMs)* e RUA ka whakaingoatia, hei whakaū pea i te korenga o ngā momorua e puta i ngā noke.

QUESTION THREE: PERIPATUS / NGĀOKEOKE – THE VELVET WORM

Although there are up to 200 species of velvet worms worldwide, in New Zealand, there are approximately 30 species. Of those 30 species, only 9 have been clearly identified and studied. It is expected that, with more DNA research, new species will be described.

Peripatus (ngāokeoke) are classified in two genera. *Peripatoides* is ovoviviparous, meaning females have live young from eggs which hatch internally. *Ooperipatellus* is oviparous, meaning females lay eggs which then hatch later. Egg-laying peripatus are found only in New Zealand and Australia. Egg-layers tend to be found in colder, more open areas, and at high altitudes, for example, the Tasman Glacier species. Those worms that have live young tend to live in warm, more enclosed habitats and at lower altitudes.

Peripatoides indigo

Live young, hatched internally, then birthed

Adult with infant

Peripatoides novaezealandiae

Discuss aspects of the evolution of velvet worms.

In your answer, include discussion of:

- allopatric speciation and sympatric speciation, including definitions
- how geological processes might give rise to increased speciation in the New Zealand velvet worm
- why DNA analysis might lead to the discovery of new species
- how TWO named, reproductive isolating mechanisms (RIMs) could ensure the worms do not form hybrids.

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.

QUESTION NUMBER

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.

QUESTION NUMBER

Ngā Mihi

Kua whakahāngaihia ngā kōrero i ngā mātāpuna e whai ake nei hei whakamahinga i tēnei whakamātautau:

Te whārangi 2

Te Whakaahua: https://www.doc.govt.nz/nature/native-animals/birds/birds-a-z/kakapo/

Te whārangi 8

Ngā Whakaahua: (*C. repens*) https://en.wikipedia.org/wiki/Coprosma_repens
(*C. ochracea*) https://en.wikipedia.org/wiki/Coprosma_ochracea
(*C. acerosa*) https://www.tawapou.co.nz/index.php/catalogue/coprosma-acerosa-red-rock

Te whārangi 14

Ngā Whakaahua: (*P. indigo*) https://www.doc.govt.nz/nature/native-animals/invertebrates/peripatus-ngaokeoke
(Te kūao), (Te kātua me te kūao) https://www.nzgeo.com/stories/velvet-underground/
(*P. novaezealandiae*) https://en.wikipedia.org/wiki/Peripatoides

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

Page 2
Image: https://www.doc.govt.nz/nature/native-animals/birds/birds-a-z/kakapo/

Page 8
Images: (*C. repens*) https://en.wikipedia.org/wiki/Coprosma_repens
(*C. ochracea*) https://en.wikipedia.org/wiki/Coprosma_ochracea
(*C. acerosa*) https://www.tawapou.co.nz/index.php/catalogue/coprosma-acerosa-red-rock

Page 14
Images: (*P. indigo*) https://www.doc.govt.nz/nature/native-animals/invertebrates/peripatus-ngaokeoke
(Live young), (Adult with newborn) https://www.nzgeo.com/stories/velvet-underground/
(*P. novaezealandiae*) https://en.wikipedia.org/wiki/Peripatoides

English translation of the wording on the front cover

Level 3 Biology 2023

91605M Demonstrate understanding of evolutionary processes leading to speciation

Credits: Four

91605M

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of evolutionary processes leading to speciation.	Demonstrate in-depth understanding of evolutionary processes leading to speciation.	Demonstrate comprehensive understanding of evolutionary processes leading to speciation.

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 any cross-hatched area (▨). 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.