91605M

916055

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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Tohua tēnei pouaka mēnā kāore he tuhituhi i roto i tēnei pukapuka

Koiora, Kaupae 3, 2020

91605M Te whakaatu māramatanga ki ngā tukanga o te kunenga mai[1] e whakaputa ai i te whakamomotanga

2.00 i te ahiahi Rātū 24 Whiringa-ā-rangi 2020
Whiwhinga: Whā

Paetae	Kaiaka	Kairangi
Te whakaatu māramatanga ki ngā tukanga o te kunenga mai e whakaputa ai i te whakamomotanga.	Te whakaatu māramatanga hōhonu ki ngā tukanga o te kunenga mai e whakaputa ai i te whakamomotanga.	Te whakaatu māramatanga matawhānui ki ngā tukanga o te kunenga mai e whakaputa ai i te whakamomotanga.

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.

[1] kukuwhatanga

TAPEKE

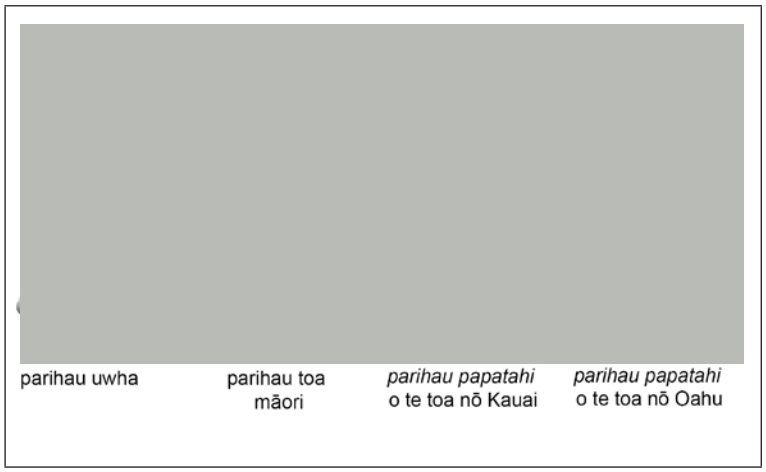
MĀ TE KAIMĀKA ANAKE

© Mana Tohu Mātauranga o Aotearoa, 2020. Pūmau te mana.
Kia kaua rawa he wāhi o tēnei tuhinga e whakahuatia ki te kore te whakaaetanga a te Mana Tohu Mātauranga o Aotearoa.

TŪMAHI TUATAHI: NGĀ PIHAREINGA PARIHAU PAPATAHI

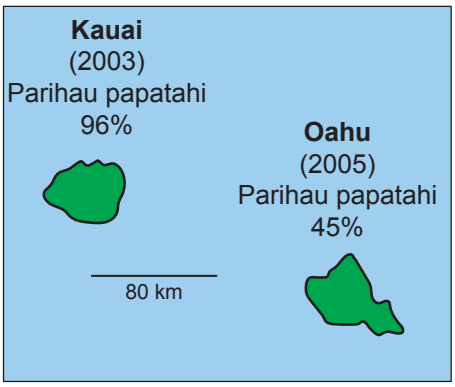
Hoahoa 1: Pihareinga toa me te rango pirinoa.

www.pnas.org/content/116/25/12116



Hoahoa 2: He whakatauritenga o ngā 'parihau papatahi' me ngā parihau māori.

https://elementy.ru/nauchno-populyarnaya_biblioteka/432357/Cverchki_zagovor_molchaniya



Hoahoa 3: E rua ngā motu nō Hawaii.

Noho ai te pihareinga o te moana i Ngā Motu o Hawaii. Kitā ai ngā parihau o ngā toa māori ina miria tahitia. Engari ko ngā toa parihau papatahi, he āhua rite ngā parihau ki ō ngā uwha, ā, kāore e kīta ēnei nā. Tangi ai ko ngā pihareinga toa ina whakawhaiāipo haere ana. Engari e ai ki ngā kitenga a ngā kairangahau ko tētahi momo pihareinga moana ngū, te *Teleogryllus oceanicus*, e rua ōna kunenga, he mea motuhake me te tere, i runga i ētahi motu pātata o Hawaii.

Ehara ko ngā uwha anake ka tahuri mai ki ngā kitā a te pihareinga toa engari ko ngā ngaro pirinoa anō, te *Ormia ochracea*, (kei te Hoahoa 1) ka whakawhānau i ana torongū ki roto i te pihareinga, ā, ka mate te pihareinga i te paopaotanga o ngā hua i te kotahi wiki i muri mai.

QUESTION ONE: FLAT-WINGED CRICKETS

Figure 1: Male cricket and parasitic fly.

www.pnas.org/content/116/25/12116

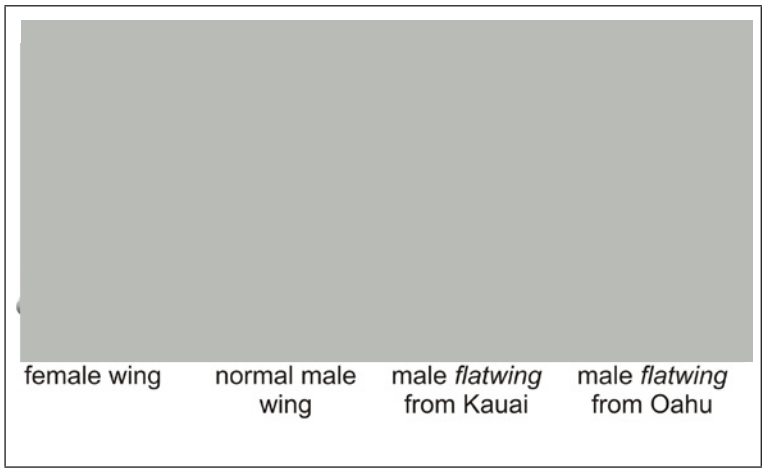


Figure 2: A comparison of 'flatwings' and normal wings.

https://elementy.ru/nauchno-populyarnaya_biblioteka/432357/Cverchki_zagovor_molchaniya

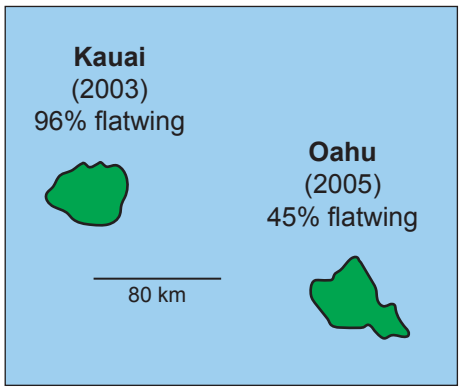


Figure 3: Two of the Hawaiian islands.

The oceanic cricket lives in the Hawaiian Islands. Normal males have wings that produce a chirp when rubbed together. Flat-winged males on the other hand, have wings more like those of a female, without the noise-making features. Usually male crickets are known to be noisy when attracting a mate. However researchers have recently shown that a silent type of the oceanic field cricket, *Teleogryllus oceanicus*, has evolved twice, independently and quickly, on two neighbouring Hawaiian islands.

The chirping sounds of the male cricket not only attract mates on these islands but also a parasitic fly, *Ormia ochracea*, (seen in Figure 1) that can lay its larvae in the cricket, killing it when the young hatch one week later.

MĀ TE KAIMĀKA ANAKE

Matapakitia ngā āhuatanga o te kunenga o te pihareinga.

I tō tuhinga, me:

- whakaatu i pēhea pea te puta o te tohuāhua parihau papatahi
- whakamārama he aha i rerekē ai te ōwehenga o ngā pihareinga parihau papatahi i ngā wāhi rerekē
- matapaki he aha ngā taunakitanga pītauira me whai pea ngā kaimātai pūtaiao hei whakaatu he kunenga ūngutu tēnei, ehara ko ngā pihareinga noa e nekeneke ana mai i tētahi motu ki tētahi.

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

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Discuss aspects of cricket evolution.

In your answer:

- suggest how the flat-wing phenotype may have arisen
- explain why different locations have different proportions of flat-winged crickets
- discuss what DNA evidence scientists might have needed to show this was convergent evolution, and not simply crickets moving from one island to another.

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

MĀ TE KAIMĀKA ANAKE

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TŪMAHI TUARUA: TE KORORĀ

MĀ TE KAIMĀKA ANAKE

https://mission-blue.org/2019/04/ocean-conservation-front-and-center-in-australia-with-sydney-coast-hope-spot/

Tētahi o ngā kutu i kitea i runga i te kororā.

https://collections.tepapa.govt.nz/agent/19598

Ko te kororā he iti, ā, kahurangi tōna tae. I Ahitereiria, e kīia ana he kororā tūrehu nā te iti o te hanga. Ahakoa ki te nuinga o ngā kaimātai pūtaiao he tāupetanga nō te momo kotahi, he taunakitanga mō te pītauira o te pata pūngao o ētahi kororā e kī ana kei te tīhoi, ā, ka puta pea hei momo motuhake. Whakaputa uri ai ngā kororā i roto pūrei i ngā takutai o te tonga o Ahitereiria me Aotearoa. Haere ai ngā kororā tūrehu ki te tonga mai i Ahitereiria ka whakawhiti i Te Tai-o-Rēhua ka huri i te takutai o te raki o Aotearoa ka noho i rō pūrei nui i Ōtākou me Ngā Pākihi-whakatekateka-a-Waitaha. Mā tēnei ka āhua ōrite tonu ngā ira o ēnei rōpū e rua, i Ahitereiria me Aotearoa.

Atu ki te 14 ngā momo kutu ka eke atu ki runga i te kororā, he pirinoa ēnei e kai ana i ngā huruhuru. Kitea ai ngā kutu i runga i ngā huruhuru, ā, nā te roa me te whāiti o te tinana kāore e mau i ngā mahi whakaene a ngā kororā i te mea ka tino piri ki ngā huruhuru. He rerekē ngā momo kutu e kitea ana i runga i ngā māhunga o ngā kororā, kāore e taea e te ngutu o te kororā, ā, he porohita te hanga. Nā ngā kutu kei runga i te kororā i taea ai e ngā kaimātai pūtaiao te hono ngā rōpū kororā, inā ka taea anake ngā kutu te whakawhiti mai i tēnā kororā ki tēnā kororā i te wā e ai ana, ā, ko te mutunga atu ko te whakamomotanga nā te noho taratahi (isolation).

Matapakitia ngā āhuatanga o te whakamomotanga mā te whakamahi i ngā mōhiohio mai i ngā tauira o ngā kororā me ngā kutu.

I tō tuhinga, me:

- tautuhi i te whakamomotanga nohowehe me te nohotahi, ka tautohu i te momo whakamomotanga i waenga i ngā kutu o te māhunga me te tinana
- whakamārama he aha i puta ai i te tūhekenga urutau ngā momo kutu maha ki tētahi momo kororā kotahi anake
- matapaki ngā tikanga noho taratahi mō te whakaputa uri (reproductive isolating mechanisms) ka hiahiatia mēnā ka pā mai te whakamomotanga i waenga i te kororā me te kororā tūrehu o Ahitereiria.

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

QUESTION TWO: LITTLE PENGUINS

ASSESSOR'S USE ONLY

https://mission-blue.org/2019/04/ocean-conservation-front-and-center-in-australia-with-sydney-coast-hope-spot/

One of the chewing lice found on the kororā.

https://collections.tepapa.govt.nz/agent/19598

Kororā, also known as little blue penguins or blue penguins, are so named because of their size and slate-blue plumage. In Australia, they are often called fairy penguins because of their small size. While most scientists still consider them variants of one species, some birds have shown mitochondrial DNA evidence that suggests that they are diverging and may become separate species. Kororā breed in colonies along the southern coastlines of Australia and New Zealand. Fairy penguins will travel south from Australia across the Tasman Sea and around the south coast of New Zealand to form large colonies in Otago and Canterbury. This ensures that these two groups, in New Zealand and Australia, maintain genetic similarity.

Kororā can have up to 14 species of chewing lice, which are small parasites that feed on their feathers. Chewing lice can be found on the feathers, where their long thin body shape allows them to avoid the preening behaviour of the penguins as they hug closely to the feathers. Chewing lice, found on the penguin heads, are a different species, and are out of range of the bird's beak and are round in shape. Chewing lice on penguins allow scientists to link penguin groups, as chewing lice can only be passed from host to host during copulation (mating), leading to speciation due to isolation.

Discuss aspects of speciation using information from the examples of the penguins and their chewing lice.

In your answer:

- define allopatric and sympatric speciation, identifying the type of speciation between the head and body chewing lice
- explain how adaptive radiation has led to so many species of chewing lice on just one species of penguin
- discuss reproductive isolating mechanisms that would need to happen if speciation were to occur between kororā and fairy penguins.

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

MĀ TE KAIMĀKA ANAKE

He wāhi anō mō tō tuhinga mō tēnei tūmahi kei te 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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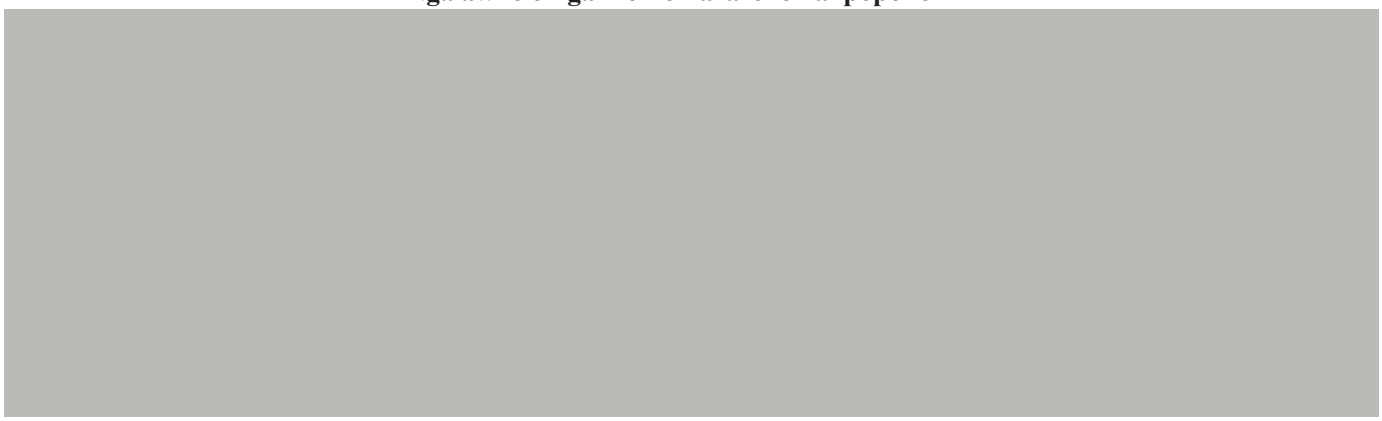
TŪMAHI TUATORU: NGĀ KARAREHE KAI PŌPOKORIKI

https://nationalzoo.si.edu/animals/giant-anteater

E whā ngā momo kararehe kai pōpokoriki nō Amerika ki te Tonga nō te rōpū *Vermilingua*: ko te kararehe kai pōpokoriki nui, te *Myrmecophaga tridactyla*, e whakaaturia ana i runga, te tamandua o te tonga, te *Tamandua tetradactyla*, te tamandua o te raki, te *Tamandua mexicana*, he haere pō tēnei, me te kararehe kai pōpokoriki hirika noho rākau, te *Cyclopes didactylus*.

Ngā awhe o ngā momo kararehe kai pōpokoriki



Kararehe kai pōpokoriki nui (kua korehāhā pea i ngā wāhi karaka)	Tamandua o te tonga	Tamandua o te raki	Kararehe kai pōpokoriki hirika
https://en.wikipedia.org/wiki/Giant_anteater	https://en.wikipedia.org/wiki/Southern_tamandua	https://en.wikipedia.org/wiki/Northern_tamandua	https://en.wikipedia.org/wiki/Silky_anteater

Kāore he niho o ngā kararehe kai pōpokoriki. Tīkina atu e ngā arero roa o ngā kararehe kai pōpokoriki ngā pōpokoriki me ngā pōpokoruatea 30 000 – 35 000 hei horomi i ia rā. I te mea tata ki te 60 miriona tau te roa o te kararehe kai pōpokoriki me ōna tīpuna taketake e kai ana i ngā pōpokoriki me ngā pōpokoruatea, kua hangā ngā pōpokoriki me ngā pōpokorua i ngā tūmomo weronga, e āwhina ai ki te pare i ngā konihi. Ka torohī mai i ngā pōpokoriki ngā matū me te whakamahi i ngā kakati hei titi i te kiri o tētahi kaikonihi. Ka kai ngā kararehe kai pōpokoriki i ngā pōpokoriki kia tae rā anō atu te kāhui nui o ngā pōpokoriki taua, he kauae koi, he matū tāoke hoki. Kātahi ka wehe atu te kararehe kai pōpokoriki, e ora ai ngā pōpokoriki kaha.

Matapakitia ngā āhuatanga o te kunenga o te kararehe kai pōpokoriki.

I tō tuhinga, me:

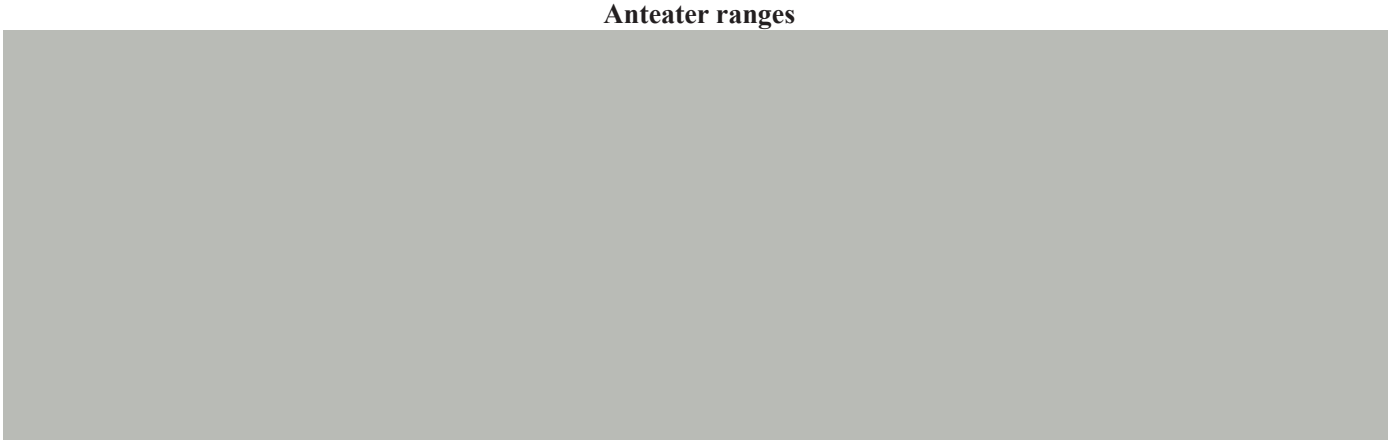
- whakaahua te tauira kunenga i kitea i roto i tēnei tauira o te hononga i waenga i ngā pōpokoriki me ngā kararehe kai pōpokoriki
- whakamārama tētahi hua pai me tētahi hua kino o tēnei hononga kunenga
- matapaki i pēhea te puta o te kunenga tīhoi i te whiringa māori i roto i ngā kararehe kai pōpokoriki.

QUESTION THREE: ANTEATERS

https://nationalzoo.si.edu/animals/giant-anteater

South America is home to four species of anteaters in the suborder *Vermilingua*: the giant anteater, *Myrmecophaga tridactyla*, shown above, the southern tamandua, *Tamandua tetradactyla*, the northern tamandua, *Tamandua mexicana*, which is mostly nocturnal, and the arboreal silky anteater, *Cyclopes didactylus*.

Anteater ranges



Giant anteater (probably extinct in orange areas)	Southern tamandua	Northern tamandua	Silky anteater
https://en.wikipedia.org/wiki/Giant_anteater	https://en.wikipedia.org/wiki/Southern_tamandua	https://en.wikipedia.org/wiki/Northern_tamandua	https://en.wikipedia.org/wiki/Silky_anteater

Anteaters are edentate animals, which means they have no teeth. Their long tongues are able to lap up the 30 000 – 35 000 ants and termites they swallow whole each day. Since the giant anteater and its evolutionary ancestors have been feasting on ants and termites for nearly 60 million years, ants and termites may have evolved various defences, which help them avoid predation. Ants can excrete chemicals and also use their jaws to pierce the skin of an attacker. Anteaters will feast on ants until soldier ants, armed with sharp mandibles and toxic chemicals, arrive in large numbers. The anteater will then move on, allowing the well-armed ants to survive.

Discuss aspects of anteater evolution.

In your answer:

- describe the evolutionary pattern seen in this example of the relationship between ants and anteaters
- explain an advantage and a disadvantage of this evolutionary relationship
- discuss how natural selection has led to divergent evolution in anteaters.

MĀ TE KAIMĀKA ANAKE

He wāhi anō mō tō tuhinga mō tēnei tūmahi kei te 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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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 2020

91605 Demonstrate understanding of evolutionary processes leading to speciation

2.00 p.m. Tuesday 24 November 2020
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 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.