See back cover for an English translation of this cover

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91605M

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NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Koiora, Kaupae 3, 2013

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

2.00 i te ahiahi Rātū 12 Whiringa-ā-rangi 2013
Whiwhinga: Whā

Paetae	Paetae Kaiaka	Paetae 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 mehemea e ōrite ana te Tau Ākonga ā-Motu (NSN) kei tō pepa whakauru ki te tau kei runga ake nei.

Me whakautu e koe te KATOA o ngā pātai kei roto i te pukapuka nei.

Ki te hiahia koe ki ētahi atu wāhi hei tuhituhi whakautu, whakamahia te (ngā) whārangi kei muri i te pukapuka nei, ka āta tohu ai i ngā tau pātai.

Tirohia mehemea kei roto nei ngā whārangi 2–15 e raupapa tika ana, ā, kāore hoki he whārangi wātea.

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

TAPEKE

MĀ TE KAIMĀKA ANAKE

© Mana Tohu Mātauranga o Aotearoa, 2013. Pūmau te mana.
Kia kaua rawa he wāhi o tēnei tuhinga e tāruatia ki te kore te whakaaetanga a te Mana Tohu Mātauranga o Aotearoa.

Kia 60 meneti hei whakautu i ngā pātai o tēnei pukapuka.

MĀ TE KAIMĀKA ANAKE

PĀTAI TUATAHI

Kitea whānuitia ngā mokomoko o te puninga *Oligosoma* i Aotearoa, ā, te āhua nei i tere tihoi haere i ngā tau 23 ki te 35 miriona ki mua, e ai ki te whakaaro he tino nui ake te whenua o Aotearoa i raro i te moana i taua wā.

He tapu tēnei rauemi. E kore taea te tuku atu. Aata tirohia ki ngā kupu kei raro iho i te pouaka nei.

O. smithi

http://www.ryanphotographic.com/scincidae.htm

He tapu tēnei rauemi. E kore taea te tuku atu. Aata tirohia ki ngā kupu kei raro iho i te pouaka nei.

O. suteri

http://whereisremi.files.wordpress.com/2010/02/024-2.jpg

Noho ai ēnei momo *Oligosoma* e rua (mokoone, *O. smithi*, me te mokomoko whakawhānau hua, *O. suteri*) hei momo noho tahi ki te whakarua o Aotearoa. Ahakoa e noho ana i roto i te wāhi kotahi, kāore he pānga pātata o ēnei momo.

Ko te *O. smithi* he mokomoko rahi-waenga, haere i te awatea, ā, ka whakawhānau kē i ana punua. Ko te *O. smithi* ka kitea whānuitia i ngā wāhi takutai me ngā motu i te moana, me te whakaatu hoki i ngā tāupetanga iranga[1].

He rerekē te *O. suteri*, ā, he tino nui ake, he ohopō me te whakawhānau hua. He whāiti ake te tohatohanga o *O. suteri* (ngā motu kei te raki), me te whakaatu i te tino iti o te tāupetanga iranga.

Matapakitia ngā pēhanga kōwhiringa tūturu tērā pea kua tino whai pānga ki te whakamomo me te tohatohanga o ēnei momo *Oligosoma* e rua i roto i ngā tau 35 miriona kua hori.

I tō whakautu me:

- whakaahua i te momo whakamomonga kua puta i waenga i ēnei momo *Oligosoma*, me ngā pūtake
- whakamārama mai he pēhea te whai wāhi o ngā āhuatanga koiora, matawhenua hoki ki te whakamomonga
- aromātai i ngā rerekētanga i roto i ngā rerekētanga iranga me ngā tauira tohatohanga i waenga i aua momo e rua.

[1] rerekētanga ā-ira

MĀ TE KAIMĀKA ANAKE

You are advised to spend 60 minutes answering the questions in this booklet.

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QUESTION ONE

Skinks belonging to the genus *Oligosoma* are endemic to New Zealand, and appear to have undergone a rapid phase of divergence 23 to 35 million years ago, when it was estimated that much more of New Zealand's land mass was under water.

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O. smithi

http://www.ryanphotographic.com/scincidae.htm

For copyright reasons, this resource cannot be reproduced here.

O. suteri

http://whereisremi.files.wordpress.com/2010/02/024-2.jpg

Two *Oligosoma* species (shore skink, *O. smithi*, and egg-laying skink, *O. suteri*) exist as sympatric species in north-eastern New Zealand. Despite living within the same area, the species are not closely related.

O. smithi are medium-sized skinks, active in daylight and give birth to live young. *O. smithi* is widely distributed in both coastal regions and off-shore islands, and shows genetic variation.

In contrast, *O. suteri* are significantly larger, nocturnal and lay eggs. Distribution of *O. suteri* is much more limited (northern off-shore islands), and shows remarkably little genetic variation.

Discuss the natural selection pressures that have most likely affected speciation and distribution of these two *Oligosoma* species over the past 35 million years.

In your answer you should:

- describe the type of speciation that has happened between these *Oligosoma* species, with reasons
- explain how biological and geographical factors have contributed to speciation
- evaluate differences in genetic diversity and distribution patterns between the two species.

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MĀ TE KAIMĀKA ANAKE

PĀTAI TUARUA

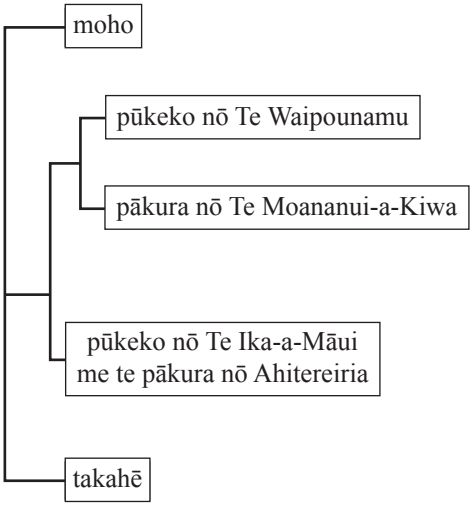
He rite te āhua o te pūkeko (*Porphyrio melanotus*) me te takahē (*Porphyrio hochstetteri*), ā, heke iho rāua i te tipuna kotahi, engari he rerekē tō rāua kunenga mai.

E ai ki ngā taunakinga parawae neke atu i te 5 miriona tau te noho a te takahē ki ngā whenua tāpotupotu me te taitapa o ngā ngahere o Aotearoa. He kore rere, he pōturi ki te whakaputa uri, ā, kei te tata korehāhā[3]. Ko te whakatau tata e 227 ngā manu kātua i te ripoinga pae maunga tūhāhā o Moho-kāherehere me ngā motu konihi-kore e whā kei te moana. Kua korehāhā te takahē o Te Ika-a-Māui, arā, te moho.

I urutomo mai te pūkeko i Aotearoa nei i roto i ngā tau 1 000 ki mua. He kaiwhakaputa uri pāhekoheko, kua tūroa te noho i ngā tahora, reporepo, me ngā whenua ahuwhenua.

Kei te kī ngā taunakinga pītauira inatata nei he tino pātata te pūkeko o Te Ika-a-Māui ki te pākura o Ahitereiria, ā, he pānga tata tō te pūkeko o Te Waipounamu ki te pākura o Te Moananui-a-Kiwa.

E whakaaturia ana te kāwai i raro.



He tapu tēnei raue-mi. E kore taea te tuku atu. Aata tirohia ki ngā kupu kei raro iho i te pouaka nei.

Takahē
www.teara.govt.nz/files/p10553pc.jpg

He tapu tēnei raue-mi. E kore taea te tuku atu. Aata tirohia ki ngā kupu kei raro iho i te pouaka nei.

Pūkeko
http://www.tiritirimatangi.org.nz/pukeko

Tātarihia te tauira o te kunenga mai me ngā tukanga i tūturu ai te takahē me te pūkeko hei momo motuhake e rua i Aotearoa.

I tō whakautu me:

- whakamārama he aha te tikanga o te tauritenga pūputu, me te whakamārama he aha i noho ai ko te tauiratanga kunenga o te takahē/pūkeko hei tauira mō tēnei
- whakamārama i ngā pēhanga kōwhiringa kunenga mai kei aua momo e rua i roto i te wā
- whakataurite i pēhea te tūroa mai o te takahē me te pūkeko i Aotearoa.

[3] tata wharengaro

MĀ TE KAIMĀKA ANAKE

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QUESTION TWO

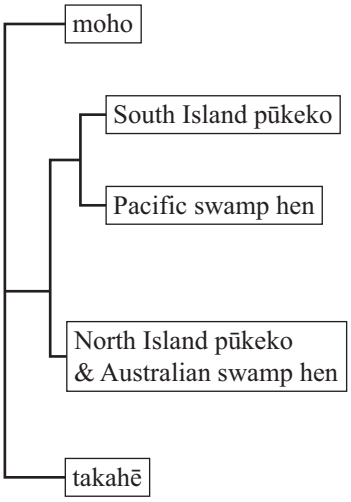
The pūkeko (*Porphyrio melanotus*) and takahē (*Porphyrio hochstetteri*) look similar and share a common ancestor, but have evolved differently.

Fossil evidence suggests takahē have been present in New Zealand lowlands and forest margins for at least 5 million years. It is flightless, a slow breeder and now endangered. There are an estimated 227 adult birds in Fiordland's isolated alpine habitat and on four predator-free off-shore islands. The North Island takahē or moho is extinct.

The pūkeko invaded New Zealand within the past 1 000 years. A cooperative breeder, it has become well established within open grassland, swamps, and agricultural lands.

Recent DNA evidence points to the pūkeko in the North Island having close connections with the Australian swamp hen, whereas South Island pūkeko show close relation to the Pacific swamp hen.

The lineage is shown below.



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Takahē
www.teara.govt.nz/files/p10553pc.jpg

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Pūkeko
http://www.tiritirimatangi.org.nz/pukeko

Analyse both the pattern of evolution and the processes that have led to the establishment of takahē and pūkeko as separate species in New Zealand.

In your answer:

- describe what is meant by punctuated equilibrium, and explain why the takahē / pūkeko pattern of evolution is an example of this
- explain the evolutionary selection pressures acting on both species over time
- compare and contrast how the takahē and pūkeko became established in New Zealand.

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PĀTAI TUATORU

Ko ngā kaihopurango ariki (*Monarcha castaneiventris*) he manu iti, kai ngāngara, e kitea ana i Ngā Moutere o Horomana o Te Moananui-a-Kiwa.

I roto i tētahi mātai o ngā taupori e rua o te momo kotahi mai i ētahi moutere pātata i kitea he pango katoa te tae o ngā manu o te moutere o Makira; ā, ko ētahi o ngā manu kei ngā moutere pātata paku ake, he pango katoa, ko ētahi atu he pango me te puku pākākā. He tino tata te tawhiti i waenga i ngā moutere.

He tapu tēnei rauemi. E kore taea te tuku atu. Aata tirohia ki ngā kupu kei raro iho i te pouaka nei.

Ngā kaihopurango ariki puku-pākākā me te pango.

http://news.sciencemag.org/sciencenow/2009/06/15-01.html

He kaha ngā manu taurawhi ki te tiaki i tō rātou rohe, engari i kitea e ngā kairangahau kāore ngā taurawhi e urupare ana ina uru mai he manu ki tō rātou rohe he rerekē te tae, he rite hoki te momo.

I kitea i roto i te huingaira kotahi anake te rerekētanga. E whakarite ana te ira MC1R i te whakanaonga manauri, e puta ai te tae o te kiri me ngā huruhuru. Ko ngā manu pango katoa, puku pākākā hoki he rerekē ō rātou putanga ira MC1R, e hua ai tētahi irakētanga waikawa amino kotahi.

Matapakitia he pēhea i puta ai te whakamomonga i roto i ngā taupori kaihopurango ariki i te irakētanga MC1R.

I tō whakautu me:

- whakamārama he aha te whakamomonga
- whakamārama he pēhea te pānga o te ira MC1R ki ngā taupori kaihopurango ariki
- aromātai i ngā pānga wā roa o tēnei tukanga ki te momo.

MĀ TE KAIMĀKA ANAKE

QUESTION THREE

Monarch flycatchers (*Monarcha castaneiventris*) are small, insect-eating birds, commonly found in the Solomon Islands of the Pacific.

A study of two populations of the same species from neighbouring islands found that birds on the island of Makira are completely black in colour; whereas on smaller adjacent islands, some of the birds are completely black and others are black with a chestnut-coloured belly. The geographical distance between islands is very small.

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Chestnut-bellied and black monarch flycatchers.

http://news.sciencemag.org/sciencenow/2009/06/15-01.html

The male birds are fiercely territorial, but researchers found that the males don't react when a differently coloured bird of the same species enters their territory.

A study of the bird's genomes found only one variation. The MC1R gene regulates production of melanin, which gives skin and feathers colour. The completely black and chestnut-bellied birds had different versions of the MC1R gene, resulting in a single amino acid mutation.

Discuss how the MC1R gene mutation could lead to speciation in populations of the monarch flycatcher.

In your answer you should:

- describe speciation
- explain how the MC1R gene may impact on the monarch flycatcher populations
- evaluate the possible long-term effects of this process on the species.

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He puka anō mēnā ka hiahiatia.
Tuhia te (ngā) tau pātai mēnā e hāngai ana.

TAU PĀTAI

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, 2013

91605 Demonstrate understanding of evolutionary processes leading to speciation

2.00 pm Tuesday 12 November 2013
Credits: Four

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.

91605M

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 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 2–15 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.

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