91605M

916055

NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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

3

SUPERVISOR'S USE ONLY

Koiora, Kaupae 3, 2017

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

9.30 i te ata Rāpare 16 Whiringa-ā-rangi 2017
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 mō ō tuhinga, whakamahia ngā whārangi wātea kei muri o tēnei pukapuka, ka āta tohu ai i ngā tau tūmahi.

Tirohia mēnā e tika ana te raupapatanga o ngā whārangi 2–15 kei roto i tēnei pukapuka, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

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

[1] kukuwhatanga

TAPEKE

MĀ TE KAIMĀKA ANAKE

TŪMAHI TUATAHI

Te tuaritanga, ngā ine, te nōhanga manako me ngā tūmomo ngutu o te moa

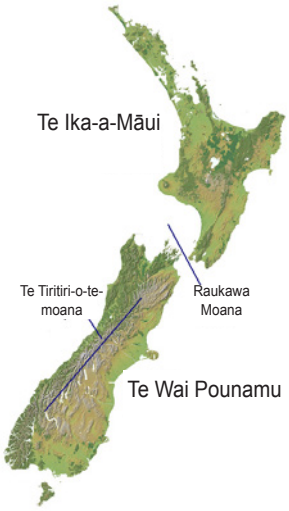
Dinornis

Whānau: Dinornithidae

Momo: Moa nunui o Te Waipounamu (kikorangi), moa nunui o Te Ika-a-Māui (whero)

Ngā ine: 56–249 kg me te 90 ki te 200 cm te tāroa - he tino rerekē ngā āhuatanga o te uha, ā, atu ki te 3 whakareanga ake te papatipu i tō ngā toa.

Nōhanga: He karore haere – kua kitea i ngā wāhi teitei, pāpaku me ngā nōhanga mārakerake o te ngahere.



Whānau: Emeidae

Momo: Moa whakateo (kākāriki), Moa waewae taumaha (kikorangi), Moa Mantell (whero)

Ngā ine: 17–163 kg me te 54 ki te 121 cm.

Nōhanga: I noho ngā moa whakaeto ki ngā wāhi tahora teitei i runga tonu ake i te wāhi e mutu ai ngā rākau, i noho kē te moa waewae taumaha me te moa Mantell i ngā taha ngahere i ngā whenua pāpaku me ngā māheuheu reporepo.

Anomalopteryx:

Whānau: Emeidae

Momo: Moa noho ngahere iti

Ngā ine: 26–64 kg me te 50 ki te 90 cm.

Nōhanga: Ngā ngahere i ngā whenua pāpaku o uta kua whai kāuru āputa-kore.

Euryapteryx:

Whānau: Emeidae

Momo: Moa noho taha moana

Ngā ine: 12–109 kg me te 51 ki te 103 cm.

Nōhanga: Ngā āhuarangi maroke ake - ngā wāhi ngahere mārakerake kei ngā whenua pāpaku me ngā wāhi taha moana.

Megalapteryx:

Whānau: Megalapterygidae

Momo: moa noho i ngā wāhi teitei

Ngā ine: 28–80 kg me te 65 ki te 95 cm.

Nōhanga: Ngā wāhi heu teitei i runga tonu ake i te wāhi e mutu ai ngā rākau, tahora me ngā ngahere i runga pae maunga (ko te tikanga he >900 m).

He mea urutau mai i: Bunce M, mā. 2009. 'The evolutionary history of the extinct ratite moa and New Zealand Neogene paleogeography'. *Proc. Natl. Acad Sci. USA* 106: 20646–20651; Attard M, mā. 2016. 'Moa diet fits the bill: virtual reconstruction incorporating mummified remains and prediction of biomechanical performance in avian giants'. *Proc. R.* Soc. 283: 2015–2043

Ko ngā moa te tino rōpū kaiota i te taiao i Aotearoa tae ki te korehāhātanga tata ki te 550 tau ki mua. He whānui te rerekē o ngā rahi me ngā tino rerekētanga ki te hanga, kaha, āhua me te mahi a te angaanga me te ngutu. E ai ki ngā tūtohutanga, kotahi te kāwai moa i noho ki Te Waipounamu i ngā tau 25 miriona ki mua. E kī ana ngā tātaritanga ira onaianei rangi i tīmata te puta o ngā momo hou i te 5.8 miriona tau ki mua, ā, i te 1.4 miriona tau ki mua i te ora ngā momo e iwa e mōhiotia ana. E ai ki ngā whakaaturanga parawae he maha ngā momo i whitiwhiti atu ki rohe kē.

Tātarihia ngā tūponotanga i hua ai pea te kunenga mai o ngā momo moa.

I tō tuhinga me:

- whakaahua ngā kupu whakamomotanga noho wehe me te whakamomotanga noho tata
- whakaahua te tauira kunenga o te moa, ME TE whakamārama ka pēhea te puta o tēnei momo tauira
- matapaki i te hiranga kunenga o te rerenga kētanga o te āhua o te ngutu moa
- tātari i ngā tukanga kunenga i whai wahi i te whakamomotanga moa.

QUESTION ONE

Distribution, dimensions, habitat preference, and bill morphology of moa

Dinornis

Family: Dinornithidae

Species: South Island giant moa (blue), North Island giant moa (red)

Dimensions: 56–249 kg and 90 to 200 cm in height – significant sexual dimorphism with females up to three times the mass of males.

Habitat: Browsing generalist – has been found in upland, lowland and open forest habitats.

Pachyornis

Family: Emeidae

Species: Crested moa (green), Heavy-footed moa (blue), Mantell's moa (red)

Dimensions: 17–163 kg and 54 to 121 cm.

Habitat: Crested moa occupied subalpine grassland, Heavy-footed moa and Mantell's moa preferred lowland forest edges and wetland vegetation.

Anomalopteryx:

Family: Emeidae

Species: Little bush moa

Dimensions: 26–64 kg and 50 to 90 cm.

Habitat: Non-coastal lowland forests with a continuous canopy.

Euryapteryx:

Family: Emeidae

Species: Coastal moa

Dimensions: 12–109 kg and 51 to 103 cm.

Habitat: Drier climates – typically lowland open forest and coastal sites.

Megalapteryx:

Family: Megalapterygidae

Species: Upland moa

Dimensions: 28–80 kg and 65 to 95 cm.

Habitat: Subalpine scrub, grassland and high country forests (usually >900 m).

Adapted from: Bunce M, et al. 2009. 'The evolutionary history of the extinct ratite moa and New Zealand Neogene paleogeography'. *Proc. Natl. Acad Sci. USA.* 106: 20646–20651; and Attard M, et al. 2016. 'Moa diet fits the bill: virtual reconstruction incorporating mummified remains and prediction of biomechanical performance in avian giants'. *Proc. R. Soc*. 283: 2015–2043

Moa were the dominant group of herbivores in ecosystems in New Zealand/Aotearoa until their extinction about 550 years ago. Moa species had a wide diversity of sizes and significant differences in the structure, strength, shape, and biomechanical performance of the skull and bill. Evidence suggests a single lineage of moa existed 25 million years ago (mya) in the South Island. Recent genetic analysis indicates new species started emerging about 5.8 mya, and by 1.4 mya, all nine known species existed. Fossil evidence indicates many of these species overlapped in geographical range.

Analyse the events that may have led to evolution of the moa.

In your answer you should:

- describe the terms allopatric speciation and sympatric speciation
- describe the pattern of evolution shown by moa, AND explain how this type of pattern can arise
- discuss the evolutionary significance of the diversity in moa bill shape
- analyse the evolutionary processes that contributed to moa speciation.

MĀ TE KAIMĀKA ANAKE

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TŪMAHI TUARUA

MĀ TE KAIMĀKA ANAKE

https://vtnews.vt.edu/articles/2016/06/fralin-garter.html

E tuari whānuitia ana te mokomoko kiri taratara (*Taricha granulosa*) puta noa i Amerika ki te Raki. He maha ngā taupori he teretāoke (tetrodotoxin) (TTX) tō rātou kei roto i te kiri, hei pare atu i ngā konihitanga. Ahakoa koinei tētahi o ngā tāokeio tino kaha rawa e mōhiotia ana, ka taea e te nākahi kāta (*Thamnophis sirtalis*) te mokomoko kiri taratara te konihi. He rerekē ngā kaha tāoke o ngā mokomoko me te parenga o ngā nākahi i tēnā rohe, i tēnā rohe.

Parenga TTX ki te Tere o te neke a te nākahi kāta

Parenga TTX	Te maha o ngā irakētanga waikawa amino	Te tere o te neke a te nākahi
Parenga iti rawa	1	tere
Parenga wawaenga	2	wawaenga
Tino parenga	3	pōturi

Tātarihia te pānga kunenga i waenga i te mokomoko kiri taratara me te nākahi kāta.

I tō tuhinga me:

- whakaahua te **tauira o te kunenga** e whakaaturia ana e taua pānga
- whakamārama he pēhea te whanake haere o tēnei momo pānga
- matapaki i te mahi a te **whiringa māori me te irakētanga** i roto i te kunenga o ngā āhuatanga e whakaaturia ana
- tātari i ngā pēhanga whiringa e hāpai ana ME TE ārai hoki i te pānga.

He wāhi anō mō tō tuhinga mō tēnei tūmahi kei ngā whārangi 8 me 9.

QUESTION TWO

ASSESSOR'S USE ONLY

https://vtnews.vt.edu/articles/2016/06/fralin-garter.html

The rough-skinned newt (*Taricha granulosa*) is distributed throughout North America. Many populations contain the poison tetrodotoxin (TTX) in the skin, which acts as a defence against predation. Despite TTX being one of the most powerful neurotoxins known, the garter snake (*Thamnophis sirtalis*) is able to prey on the rough-skinned newt. The levels of toxicity of newts and the resistance of the garter snakes vary geographically.

TTX Resistance vs Speed at which the garter snake can move

TTX resistance	Number of amino acid mutations	Speed at which the snake can move
Least resistant	1	fast
Intermediate resistant	2	intermediate
Most resistant	3	slow

Analyse the evolutionary relationship between the rough-skinned newt and the garter snake.

In your answer you should:

- describe the **pattern of evolution** shown by the relationship
- explain how this kind of relationship develops
- discuss the role of **natural selection and mutation** in the evolution of the features shown
- analyse the selection pressures that work both for AND against the relationship.

There is more space for your answer to this question on pages 8 and 9.

MĀ TE KAIMĀKA ANAKE

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TŪMAHI TUATORU

MĀ TE KAIMĀKA ANAKE

He puninga wāpu kātahi nei ka kitea te *Shireplitis*, ā, he mea taketake ki Aotearoa. E tino kitea ana ēnei momo i ngā pūkohu, paparanga otaota, wī rānei, i ngā teitei wawaenga o ngā pae maunga.

He puninga wāpu wehe kē te *Paroplitis* e tino tuarihia ana i Uropi me Te Raki o Amerika, ā, noho ai ētahi momo i ngā teitei wawaenga.

He āhua ōrite te āhua o te *Shireplitis* me te *Paroplitis*, he ōrite te rahinga iti, he 2 mm te roa o te tinana, he poto me te māene te puku, he pariko, he waewae poto kaha, ā, he poto ngā pihi. Ka whakapirinoa te *Shireplitis* me te *Paroplitis* i ngā anuhe. E mōhiotia noa iho ana ngā anuhe papa mō te momo o Uropi, ko te *Paroplitis wesmaeli*. Kotahi te momo papa he kai pūkohu, ā, ko tētahi atu he kai pūkohu me ngā wī. Ko te whakapae a ngā kaimātai koiora tērā pea ka whakapirinohotia ngā anuhe kai pūkohu, rau taka, pūkorukoru, harore rānei e te *Shireplitis*.

Ngā momo *Shireplitis* e ono.

http://microgastrinae.myspecies.info/microgastrinae/shireplitis

Paroplitis wesmaeli

http://microgastrinae.myspecies.info/gallery?f[0]=im_field_taxonomic_name%3A28649&f[1]=im_field_taxonomic_name%3A28644

Matapakitia te tauira kunenga ME NGĀ pēhanga whiringa i whai wāhi ki tēnei tauira mō te *Shireplitis* me te *Paroplitis*.

I tō tuhinga, me:

- whakaahua te pēhanga whiringa ME te tauira kunenga e whakaaturia ana e te *Shireplitis* me te *Paroplitis*
- whakaahua i ngā hanganga pūira huirua me ngā hanganga ōrite
- whakamahi ngā mōhiohio i runga ake hei whakamārama he pēhea te pānga o ngā hanganga ōrite ki te tauira kunenga e whakaaturia ana e te *Shireplitis* me te *Paroplitis*
- matapaki, mā te whakamahi i ngā whakaaturanga kei te rauemi, he pēhea te ara mai o tēnei tauira kunenga.

He wāhi anō mō tō tuhinga mō tēnei tūmahi kei ngā whārangi 12 me 13.

QUESTION THREE

ASSESSOR'S USE ONLY

Shireplitis is a newly discovered genus of wasp endemic to New Zealand / Aotearoa. These species are mostly found in moss, litter, or tussock grasslands, at moderate altitude on mountain ranges.

Paroplitis is an unrelated genus of wasp, mostly distributed in Europe and North America, with some species living at moderate altitudes.

Shireplitis and *Paroplitis* look similar, with shared features being their relatively small size with a body length of about 2 mm, short and smooth abdomen, dark colour, short and robust legs, and short antenna. *Shireplitis* and *Paroplitis* both parasitise caterpillars. Host caterpillars are only known for the European species *Paroplitis wesmaeli*. One of these host species feeds on moss while another feeds on moss and grasses. Biologists hypothesise that *Shireplitis* may parasitise caterpillars that feed on moss, leaf-litter, dead wood, or fungi.

The six species of *Shireplitis*.

http://microgastrinae.myspecies.info/microgastrinae/shireplitis

Paroplitis wesmaeli

http://microgastrinae.myspecies.info/gallery?f[0]=im_field_taxonomic_name%3A28649&f[1]=im_field_taxonomic_name%3A28644

Discuss the evolutionary pattern AND selection pressures that have contributed to this pattern for *Shireplitis* and *Paroplitis*.

In your answer:

- describe selection pressure AND the pattern of evolution shown by *Shireplitis* and *Paroplitis*
- describe homologous structures and analogous structures
- using the information above, explain how analogous structures are related to the pattern of evolution shown by *Shireplitis* and *Paroplitis*
- discuss, using the evidence from the resource material, how this evolutionary pattern could arise.

There is more space for your answer to this question on pages 12 and 13.

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

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English translation of the wording on the front cover

Level 3 Biology, 2017

91605 Demonstrate understanding of evolutionary processes leading to speciation

9.30 a.m. Thursday 16 November 2017
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 2–15 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.