91157M

911575

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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

2

SUPERVISOR'S USE ONLY

Koiora, Kaupae 2, 2016

91157M Te whakaatu māramatanga ki te rerekētanga ā-ira me te huringa

9.30 i te ata Rāmere 18 Whiringa-ā-rangi 2016
Whiwhinga: Whā

Paetae	Kaiaka	Kairangi
Te whakaatu māramatanga ki te rerekētanga ā-ira me te huringa.	Te whakaatu māramatanga hōhonu ki te rerekētanga ā-ira me te huringa.	Te whakaatu māramatanga matawhānui ki te rerekētanga ā-ira me te huringa.

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 te (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 2–19 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: TE TUKUNGA IHO ME TE WHĀITI PŪIRA

MĀ TE KAIMĀKA ANAKE

E whakaatu ana te rohi i te tino ngoi i roto i tōna tae putiputi me tōna whakaraerae ki ētahi tahumaero. He ngoi te irarā mō ngā raupua whero (R) ki te irarā mō ngā raupua mā (r). Tāpiri ki tēnei, he ngoi te irarā mō ngā raupua pakari (H) ki te irarā mō te whakaraerae ki ngā korotiwha raupua (h). Ko ngā korotiwha raupua he kōiraira kei runga i te rau e noho mōrearea ana ki te tahumaero me te tūkinotanga. Ka kitea ngā ira mō te tae raupua me ngā rau pakari i ngā pūira rerekē.

Rau korotiwha.

https://edis.ifas.ufl.edu/pp267

http://www.tophdwallpaersland.com/red-white-rose-wallpaper.htm

I whakawhitia tētahi rōhi he iraruarite mō te raupua whero me te rau pakari ki tētahi rōhi mā he whakaraerae ki ngā korotiwha rau.

(a) Whakatauhia te tohuira o te reanga F1 ka puta i tēnei whakawhitinga.

(b) Whakamahia te tūtohi Punnett hei whakaatu i ngā tohuhema[1] o te whakawhitinga F1, me ngā tohuira katoa ka tāea o te reanga F2.

Ngā tohuhema F_1				
Ngā tohuhema F_1				

[1] pūtau hema

QUESTION ONE: INHERITANCE AND MEIOSIS

ASSESSOR'S USE ONLY

Roses display complete dominance in both their flower colour and in their susceptibility to some diseases. The allele for red petals (R) is dominant to the allele for white petals (r). In addition, the allele for healthy leaves (H) is dominant to the allele for being susceptible to leaf lesions (h). Leaf lesions are spots on the leaf that are very prone to disease and injury. The genes for petal colour and healthy leaves are located on different chromosomes.

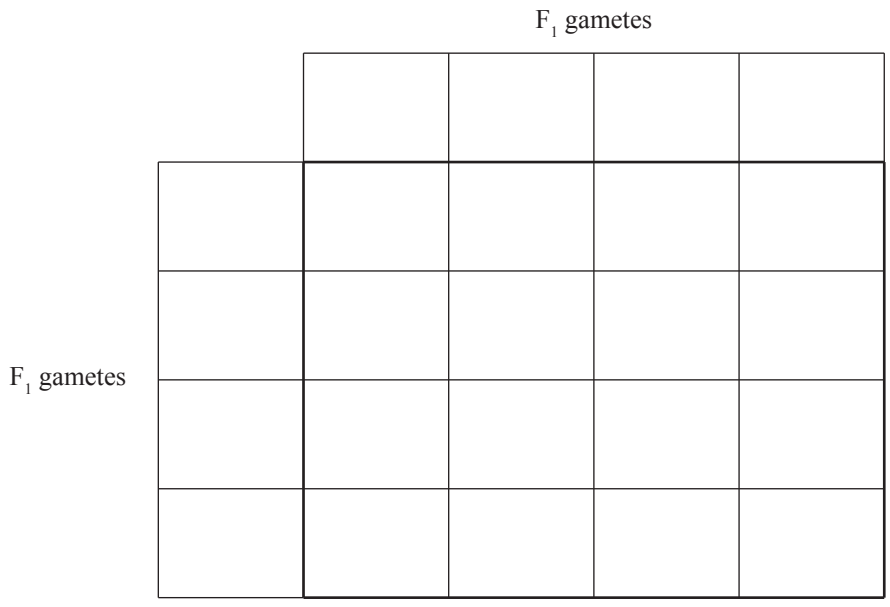
Leaf with lesions.
https://edis.ifas.ufl.edu/pp267

http://www.tophdwallpaersland.com/red-white-rose-wallpaper.htm

A rose that was homozygous for both red petals and healthy leaves was crossed with a white rose that was susceptible to leaf lesions.

(a) State the genotype of the F1 generation this cross produces.

(b) Use the Punnett square below to show the gametes of the F1 cross, and all of the possible genotypes of the F2 generation.



(c) Whakaahuahia ngā ōwehenga tohuāhua ka matapaehia ka puta i tēnei whakawhitinga.

MĀ TE KAIMĀKA ANAKE

(c) Describe the predicted phenotype ratios produced by this cross.

ASSESSOR'S USE ONLY

(d) Matapakihia ngā tukanga ka whakaputa i te rerekētanga ā-ira i te wā o te whāiti pūira, ā, he pēhea te rerekē o ngā tohuhema ki ngā pūtau matua.

MĀ TE KAIMĀKA ANAKE

Me whakauru ki tō tuhinga:

- he whakaahuatanga o te whāiti pūira me ngā momo pūtau ka puta i te whāiti pūira
- he whakamāramatanga o ngā tukanga o te hiatonga korehere, whakawehenga, me te whakawhiti atu
- he matapakitanga ka pēhea te tautoko a ia tukanga ki te rerekētanga ā-ira o ngā pūtau ka puta.

Ka whakaaetia te whakamahi hoahoa hei tautoko i tō tuhinga.

He wāhi anō mō tō tuhinga mō tēnei tūmahi kei te whārangi 8.

(d) Discuss the processes that produce genetic variation during meiosis, and how gametes differ from parent cells.

ASSESSOR'S USE ONLY

Your answer should include:

- a description of meiosis and the type of cells produced by meiosis
- an explanation of the processes of independent assortment, segregation, and crossing over
- a discussion of how each process contributes to the genetic variation of cells produced.

You may use diagrams in your answer.

There is more space for your answer to this question on page 9.

MĀ TE KAIMĀKA ANAKE

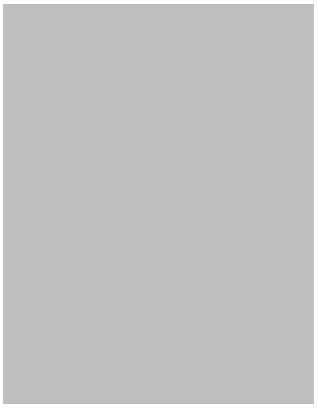
ASSESSOR'S USE ONLY

MĀ TE KAIMĀKA ANAKE

TŪMAHI TUARUA: TE WHIRINGA MĀORI I ROTO I TE MOA

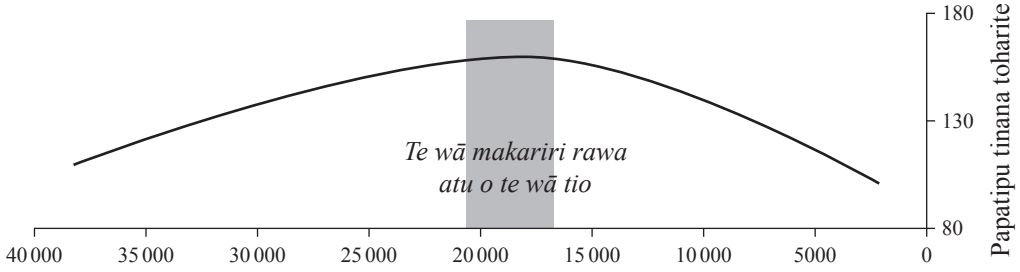
He huapai tētahi papatipu tinana nui i roto i ngā āhuarangi makariri ake i te mea ka āwhina te ōwehenga pāpaku o te horahanga mata ki te rōrahi i ngā kararehe ki te pupuri i te mahana. He maha ngā tauira o ēnei e kitea ana i ēnei rā, pērā i ngā pea hurumā, ngā marakihau me ngā whāngote moana kōpaka nui.

E whakaatu ana ngā mātātoka i te wā o te wā tio whakamutunga, he nui ake te āhua o ngā moa waewae-taumaha, *Pachyornis elephantopus*, ki aua momo moa anō i ora i ngā wā mahana ake. I te mutunga haere o te wā tio me te mahana haere o te pāmahana, e whakaatu ana ngā mātātoka i pakupaku haere anō te papatipu tinana o te moa waewae-taumaha.



http://collections.tepapa.govt.nz/search.aspx?term=Heavy-footed moa

Rerekētanga ki te papatipu tinana o te moa i roto i te wā



Ngā raraunga papatipu tinana moa i tātaihia mai i ngā paenga porowhita o ngā kōiwi pūkaka.

Worthy, Trevor H. rāua ko Richard N. Holdaway, 2002. *The Lost World of the Moa, Prehistoric life in New Zealand* (Indiana University Press, Bloomington), Tūtohi 5.6, wh. 20.

I uru atu pea te irarā papatipu nui ki te taupori mā tētahi irakētanga.

Matapakitia i pēhea te whakapūmau o te irarā papatipu tinana nui ki roto i te puna ira o ngā moa waewae-taumaha i te wā tio whakamutunga.

Me whakauru ki tō tuhinga:

- he whakaahuatanga he aha te puna ira[2]
- he whakaahuatanga he aha te irakētanga, ā, me tētahi whakamārama he pēhea tana pānga ki te rerekētanga ā-ira i roto i tētahi momo
- he matapakinga o te tukanga o te whiringa māori me te āhua o tana whai pānga ki te papatipu tinana me te puna ira o te moa waewae-taumaha
- he matapakinga, me ngā pūtake parahau, he aha i hoki ai te papatipu tinana o te moa waewae-taumaha ki tētahi papatipu paku ake ina mahana haere anō te āhuarangi.

He wāhi anō mō tō tuhinga mō tēnei tūmahi kei te whārangi 12.

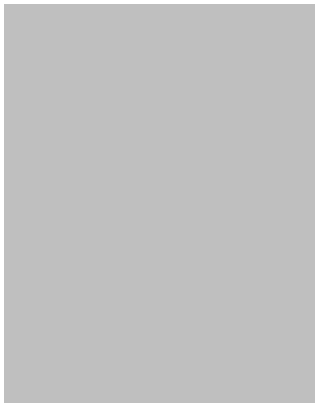
[2] mātāira

QUESTION TWO: NATURAL SELECTION IN MOA

ASSESSOR'S USE ONLY

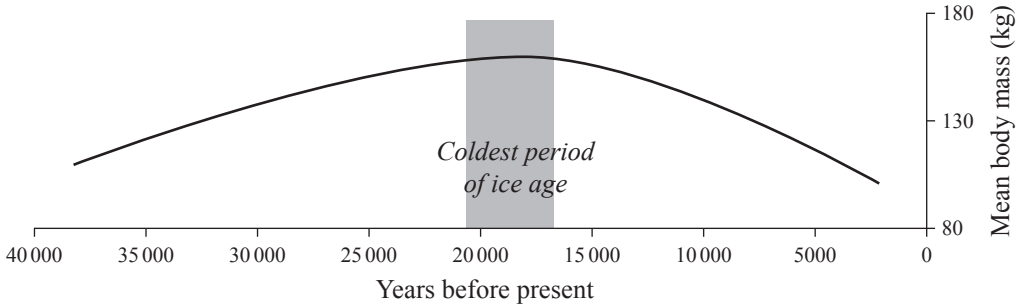
A large body mass is an advantage in cooler climates because its low surface area to volume ratio helps animals to retain heat. Many examples of this, such as polar bears, walrus and large polar sea mammals, are seen today.

Fossil evidence shows that during the last ice age, the population of heavy-footed moa, *Pachyornis elephantopus*, contained much larger individuals than the same species of moa that existed during warmer times. As the ice age ended and temperatures warmed, the fossil evidence shows that the heavy-footed moa's body mass became smaller again.



http://collections.tepapa.govt.nz/search.aspx?term=Heavy-footed moa

Change in moa body mass over time



Moa body mass data calculated from femur bone circumferences.

Worthy, Trevor H. and Richard N. Holdaway, 2002. *The Lost World of the Moa, Prehistoric life in New Zealand* (Indiana University Press, Bloomington), Table 5.6, p. 20.

The large body mass allele may have entered the population via a mutation.

Discuss how the allele for large body mass became established in the heavy-footed moa gene pool during the last ice age.

Your answer should include:

- a description of what a gene pool is
- a description of what a mutation is and an explanation of how it affects genetic variation in a species
- a discussion of the process of natural selection and how it affected both the body mass and the gene pool of the heavy-footed moa
- a discussion, with justified reasons, why the body mass of the heavy-footed moa returned to a smaller mass once the climate warmed again.

There is more space for your answer to this question on page 13.

MĀ TE KAIMĀKA ANAKE

ASSESSOR'S USE ONLY

TŪMAHI TUATORU: TE NUKU IRANGA[3] ME TE HEKENGA

MĀ TE KAIMĀKA ANAKE

He maha ngā momo māori o Aotearoa i haumate ai te tipu o te taupori nā te aruaru, nā ngā konihi o tāwāhi, me te tūkino i te wāhi noho. I tutuki i Te Papa Atawhai te whakaora i ētahi o ēnei momo kia kore ai e ngaro mā te neke i ētahi takirua whakatipu mai i ngā taupori o te tuawhenua ki ngā moutere kāore he konihi. Engari, he uaua te pupuri i te rerenga kētanga ā-ira i roto i ngā taupori moutere mō ngā momo manu rerekore maha, pēnei i te takahē, *Porphyrio hochstetteri*.

www.nzbirdsonline.org.nz/species/south-island-takahe

Matapakitia ngā raruraru o te pupuri i te rerenga kētanga ā-ira i roto i ngā taupori moutere iti o ngā manu rerekore, pēnei i te takahē.

Me whakamahi tō tuhinga i te takahē me te whakauru i:

- tētahi whakaahuatanga he aha te rerengā kētanga ā-ira
- tētahi whakamāramatanga he pēhea te whai pānga o te auautanga irarā i roto i te taupori nā te nuku iranga me te hekenga
- tētahi matapakinga he pēhea te whai pānga o te hekenga me te nuku iranga ki te rerenga kētanga ā-ira o ngā manu rerekore kei ngā taupori moutere iti tēnā i ngā taupori nui ake kei te tuawhenua.

He wāhi anō mō tō tuhinga mō tēnei tūmahi kei te whārangi 16.

[3]terenga iranga

QUESTION THREE: GENETIC DRIFT AND MIGRATION

ASSESSOR'S USE ONLY

Many of New Zealand's native species have suffered population bottlenecks due to hunting, introduced predators, and habitat destruction. The Department of Conservation has successfully saved some of these species from extinction by moving several breeding pairs from mainland populations to predator-free islands. However, maintaining genetic diversity on island populations can be difficult for many species of flightless birds, such as the takahe, *Porphyrio hochstetteri*.

www.nzbirdsonline.org.nz/species/south-island-takahe

Discuss the issues of maintaining genetic diversity in small island populations of flightless birds, such as the takahe.

Your answer should use the takahe and include:

- a description of what genetic diversity is
- an explanation of how allele frequency in a population is affected by genetic drift and migration
- a discussion of how migration and genetic drift affect genetic diversity of flightless birds on small island populations compared to larger mainland populations.

There is more space for your answer to this question on page 17.

MĀ TE KAIMĀKA ANAKE

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

ASSESSOR'S USE ONLY

English translation of the wording on the front cover

Level 2 Biology, 2016

91157 Demonstrate understanding of genetic variation and change

9.30 a.m. Friday 18 November 2016
Credits: Four

91157M

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of genetic variation and change.	Demonstrate in-depth understanding of genetic variation and change.	Demonstrate comprehensive understanding of genetic variation and change.

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 2–19 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.