91157M

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NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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

Koiora, Kaupae 2, 2018

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

9.30 i te ata Rāmere 23 Whiringa-ā-rangi 2018
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 2–21 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 WHĀITI PŪIRA

MĀ TE KAIMĀKA ANAKE

E whakaatu ana ngā ngeru i te tino ngoi i roto i te roa me te tae o ngā huruhuru. He ngoi[1] te irarā mō ngā akoti (A) ki te irarā ehara i te akoti (a). He ngoi te irarā mō ngā huruhuru poto (H) ki te irarā huruhuru roa (h). E hohoko ana ngā tāhei tae pango me te kōwhai i te kakau huru o te tohuāhua akoti, ā, e mōhiotia anō ko te tabby. He kanotahi te kakau huru o te tohuāhua ehara i te akoti. Kāore he hononga i waenga i ngā ira mō te roa me te tae o ngā huruhuru.

Tohuāhua akoti (tabby)	**Tohuāhua ehara i te akoti**
	
www.langfordvets.co.uk/diagnostic-laboratories/diagnostic-laboratories/general-info-breeders/list-genetic-tests/agouti-coat	http://thecreativecat.net/tag/long-haired-black-cat/

I whakawhitia tētahi poti iraruarite mō te akoti me ngā huruhuru poto ki te mea ehara i te akoti he whai huruhuru roa.

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

(b) Whakamahia te tūtohi Punnett i raro nei hei whakaatu i ngā tohuhema[2] o te whakawhitinga F1, me ngā tohuira katoa ka taea o te reanga F2.

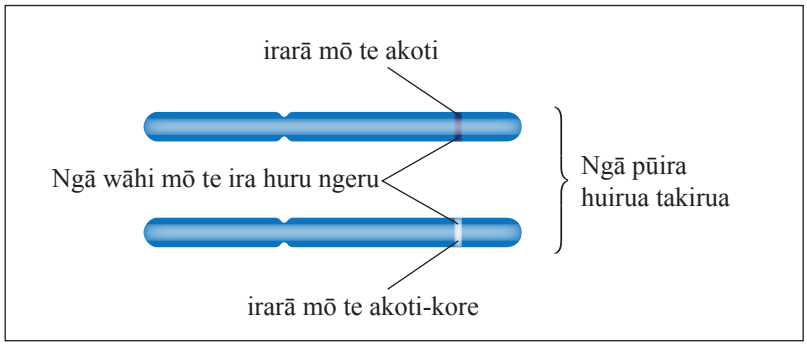
	Ngā tohuhema F1			
Ngā tohuhema F1				

[1] tāpua
[2] pūtau hema

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

(d) Kei roto ngā pūira huirua i ngā tukanga whāiti pūira, engari kāore e kitea i roto i ngā pūtau tamāhine ka hua i te whāiti pūira.

Hoahoa e whakaatu ana i te pūira huirua



He mea urutau mai i: Campbell N.A. rāua ko Reece J. B., 2005. *Biology 7th ed.* (San Francisco: Pearson/Benjamin Cummings, 2008), wh. 255.

Matapakitia he pēhea te whai wāhi atu o ngā pūira huirua i roto i te whakapiki i te rerekētanga ā-ira, Ā, he aha i kitea ai ēnei i roto i ngā pūtau i te tīmatanga o te whāiti pūira, engari kāore i roto i ngā pūtau i te mutunga o te whāiti pūira.

Me whakauru ki roto i tō tuhinga:

- he whakaahuatanga o ngā pūira huirua
- he whakamāramatanga o ngā pūira huirua i roto i ngā tukanga o te whakawhitinga atu, te hiatonga korehere me te whakawehenga
- he matapakinga he aha e kitea ai ngā pūira huirua i ngā pūtau matua (pūirarearua) engari kaua i ngā pūtau tamāhine (pūirareatahi) o te whāiti pūira.

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

QUESTION ONE: MEIOSIS

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Cats display complete dominance in both their hair length and colouration. The allele for agouti (A) is dominant to the allele for non-agouti (a). The allele for short hair (H) is dominant to the allele for long hair (h). The hair shaft of the agouti phenotype has alternating bands of black and yellow colouration, also known as tabby. The hair shaft of the non-agouti phenotype is solid colouration. The genes for hair length and colouration are not linked.

Agouti (tabby) phenotype	Non-agouti phenotype
	
www.langfordvets.co.uk/diagnostic-laboratories/diagnostic-laboratories/general-info-breeders/list-genetic-tests/agouti-coat	http://thecreativecat.net/tag/long-haired-black-cat/

A cat that was homozygous for both agouti and short hair was crossed with a non-agouti that had long hair.

(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.

F1 gametes

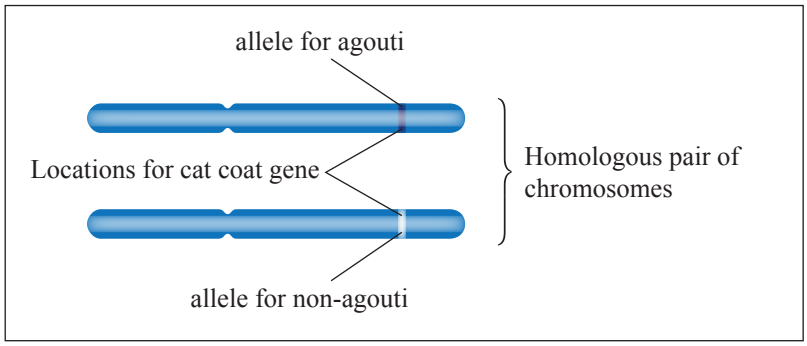
F1 gametes				

ASSESSOR'S USE ONLY

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

(d) Homologous chromosomes are involved in the processes of meiosis, but they are not found in the daughter cells resulting from meiosis.

Diagram showing homologous chromosomes



Adapted from: Campbell N.A. & Reece J. B., 2005. *Biology 7th ed.* (San Francisco: Pearson/Benjamin Cummings, 2008), p. 255.

Discuss how homologous chromosomes are involved in increasing genetic variation AND why they are found in the cells at the start of meiosis, but not in the cells at the end of meiosis.

In your answer include:

- a description of homologous chromosomes
- an explanation of homologous chromosomes in the processes of crossing over, independent assortment, and segregation
- a discussion of why homologous chromosomes are found in parental cells (diploid), but not daughter cells (haploid) of meiosis.

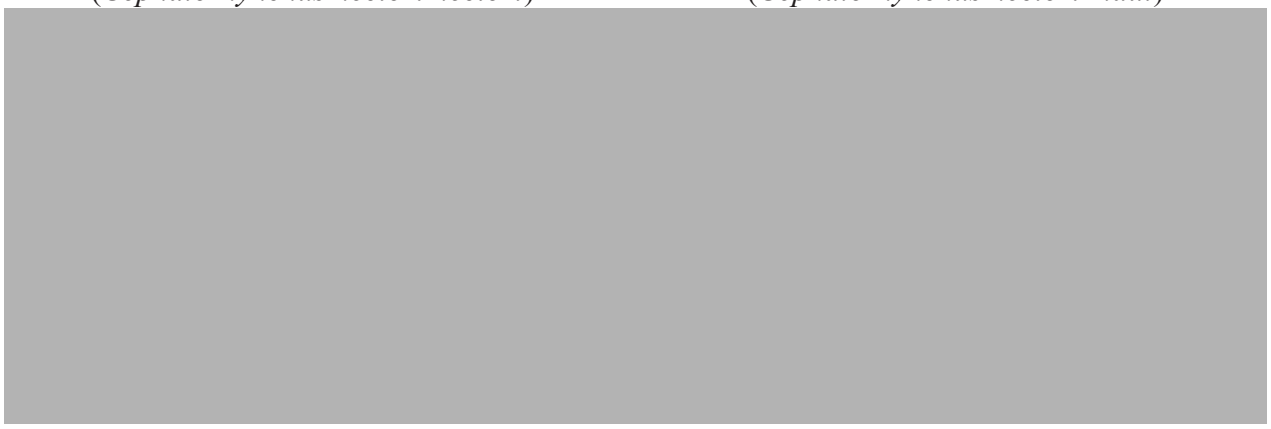
There is more space for your answer to this question on the following page.

MĀ TE KAIMĀKA ANAKE

ASSESSOR'S USE ONLY

TŪMAHI TUARUA: TE IRANGA TAUPORI

MĀ TE KAIMĀKA ANAKE

Te Tūpoupou (*Cephalorhynchus hectori hectori*)	**Te Popoto** (*Cephalorhynchus hectori maui*)
	
www.takepart.com/article/2015/05/28/world-smallest-dolphins-could-be-gone-15-years/	www.thinglink.com/scene/636989356719996928

He momo taketake te tūpoupou me te popoto (e kitea ana i ngā wai o Aotearoa noa iho). E kīia ana he momoiti wehekē ēnei; engari nā te tino pātahitanga tata ka taea ngā momo e rua te whakaputa uri tētahi ki tētahi.

Ko te whakatau tata mō te taupori o te tūpoupou he 7 270, ā, ko te whakatau mō tēnei momo kua 'Tata te korehāhā'. Ko te whakatau tata mō te taupori o ngā popoto he 80, ā, ko te whakatau mō ēnei he momo kua'Tino tata te korehāhā'.

Matapakitia ngā āhuatanga e whai pānga ana ki te auautanga irarā i roto i ngā taupori o te tūpoupou me te popoto ME ngā mutunga mēnā ka whakaputa uri whakawhiti momo i waenga i aua momo e rua.

Me whakauru ki roto i tō tuhinga:

- he whakaahuatanga o te auautanga irarā
- he whakamāramatanga o te whakawhāiti iranga ME ngā pānga ki te auautanga irarā o te popoto
- he whakaahuatanga o te terenga iranga ME te pānga o tēnei ki ngā taupori e rua
- he matapakinga ka pēhea pea te pānga o te whakaputa uri whakawhiti momo a te tūpoupou me te popoto ki te auautanga irarā ME te rerenga kētanga ā-ira o ngā taupori e rua.

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

QUESTION TWO: POPULATION GENETICS

ASSESSOR'S USE ONLY

Hector's Dolphin
(*Cephalorhynchus hectori hectori*)

www.takepart.com/article/2015/05/28/world-smallest-dolphins-could-be-gone-15-years/

Māui Dolphin
(*Cephalorhynchus hectori maui*)

www.thinglink.com/scene/636989356719996928

Hector's and Māui dolphins are endemic to New Zealand (found only in New Zealand). They are considered separate subspecies; however, they are so closely related that they are able to interbreed.

Hector's dolphin population is estimated to be 7270 individuals and is classified as 'Endangered'. Māui dolphin population is estimated to be 80 individuals and is classified as 'Critically Endangered'.

Discuss the factors that affect allele frequency in the Hector's and Māui dolphin populations AND the consequences if interbreeding takes place between the two species.

In your answer include:

- a description of allele frequency
- an explanation of a genetic bottleneck AND its effects on the Māui dolphins' allele frequency
- a description of genetic drift and AND how it affects both populations
- a discussion of how interbreeding Hector's and Māui dolphins might affect allele frequency AND genetic diversity of both populations.

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

MĀ TE KAIMĀKA ANAKE

ASSESSOR'S USE ONLY

TŪMAHI TUATORU: TE WHIRINGA MĀORI

MĀ TE KAIMĀKA ANAKE

Ia toto me ngā pūtau toto māori, āhua piko hoki

Mātāpuna: http://kidshealth.org/en/parents/sickle-cell-anemia.html

Ko te kawehā te pūmua i roto i te toto e kawe ana i te hāora. Ka hua ake te mate pūtau āhua piko mai i tētahi irakētanga ki te ira kawehā. Nā te irarā irakē (r) ka rerekē te āhua o tētahi pūtau toto whero pūnoa (R), ā, ka hikawaru me te piko-taratara o te āhua. Ka poropūtoi mai ngā pūtau piko i te nuinga o te wā, ā, kāore e tino tōtika te mahi ki te kawe hāora.

E kīia ana ko te mate pūtau piko he irarā ngoikore[1] whakamate me te whakaatu i te tukunga iho ngoi-ngātahi.

(a) Whakamāramahia mai te kupu irarā whakamate.

(b) Ka puta i te tukunga iho ngoi-ngātahi ngā tohuira, tohuāhua hoki e toru.

Whakamāramahia mai te ngoi-ngātahi ME te tuhi mai i ngā tohuāhua mō te Rr me te rr kei te tūtohi i raro.

Tohuira	Tohuāhua
RR	pūnoa
Rr	
rr	

[1] huna

QUESTION THREE: NATURAL SELECTION

ASSESSOR'S USE ONLY

Blood vessel with both normal and sickle blood cells

Source: http://kidshealth.org/en/parents/sickle-cell-anemia.html

Haemoglobin is the protein in the blood that carries oxygen. Sickle cell disorder is caused by a mutation to the haemoglobin gene. The mutated allele (r) causes a normal red blood cell (R) to alter shape and become irregular and spiky-sickle shaped. Sickle cells have a tendency to clump together and work less efficiently to carry oxygen.

Sickle cell disorder is considered a recessive lethal allele and shows co-dominance inheritance.

(a) Describe the term lethal allele.

(b) Co-dominance inheritance produces three possible genotypes and phenotypes.

Describe co-dominance AND state the phenotypes for Rr and rr in the table below.

Genotype	Phenotype
RR	normal
Rr	
rr	

(c) Ko te auautanga o te irarā pūtau piko e hāngai ana ki te tuaritanga o te pirinoa *Plasmodium falciparum*. Ko tēnei pirinoa tētahi pūtake o te tahumaero eku. I ngā āhuatanga taumaha ko te mate te mutunga atu o te whai eku. Kei roto i te irarā pūtau piko (r) he painga mō te mate eku. He iti te konurehu o ngā pūtau piko, ā, ka mate te pirinoa i roto i ēnei pūtau. Ko ngā tāngata kua tohuāhua pūnoa (RR) ka tūpono ki te tahumaero eku.

MĀ TE KAIMĀKA ANAKE

Whakamahia ngā mōhiohio kua tukuna hei **matapaki** he aha i noho tonu ai te irarā pūtau piko ki ngā taupori, ahakoa he irarā whakamate tēnei.

Me whakauru ki roto i tō tuhinga:

- he whakamāramatanga o te whiringa māori
- he matapakinga he pēhea te pānga o te whiringa māori ki ngā tohuāhua ka whakaputaina e ngā tohuira pūtau piko ME te homai i ngā pūtake parahau mō te take ka noho tonu te irarā ngoikore whakamate ki ngā taupori.

ASSESSOR'S USE ONLY

(c) The frequency of the sickle cell allele corresponds to the distribution of the parasite *Plasmodium falciparum*. This parasite causes the disease malaria. In severe cases malaria can cause death. The sickle cell allele (r) offers a survival advantage against malaria. Sickle cells have low potassium levels, which causes the parasite inside these cells to die. Individuals with normal phenotype (RR) are very susceptible to malaria.

Use the information provided to **discuss** why the sickle cell allele remains in populations, even though it is a lethal allele.

In your answer include:

- an explanation of natural selection
- a discussion of how natural selection affects the phenotypes produced by the sickle cell genotypes AND provide justified reasons why the recessive lethal allele remains in the population.

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

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 2 Biology, 2018

91157 Demonstrate understanding of genetic variation and change

9.30 a.m. Friday 23 November 2018
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 2–21 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.