See back cover for an English translation of this cover



91157M



Koiora, Kaupae 2, 2013

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

9.30 i te ata Rāmere 22 Whiringa-ā-rangi 2013 Whiwhinga: Whā

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

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 2–17 e raupapa tika ana, ā, kāore hoki he whārangi wātea.

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

TAPEKE

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

MĀ TE KAIMĀKA ANAKE

PĀTAI TUATAHI: KĀWAIHEKE PARITO PŪRUA

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

http://brian-howlett.blogspot.co.nz/2010/05/sweet-pea-purple.html

I roto i te tipu pī reka, *Lathyrus odoratus*, he ngoi ake te irarā mō te tae putiputi waipoporo (P) i te irarā mō te tae putiputi whero (p). Ka whakarite tētahi ira tuarua i te hanga o te hae. He ngoi ake te hae roa (L) i te hae porohita (l)

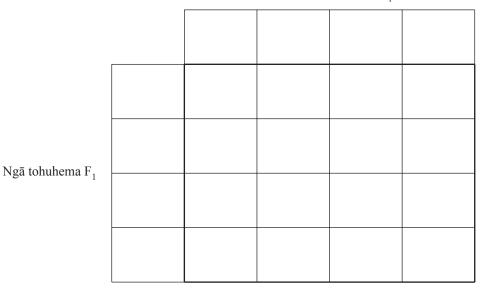
(a) Ka whakawhitia tētahi tipu PPLL waiporoporo, hae roa, ki tētahi tipu ppll whero, hae porohita.

Homai te tohuira o te whakatipuranga F_1 :

E rua ngā tipu whakatipuranga F₁ i whakawhitia kia puta ko ngā tipu whakatipuranga F₂.

(b) Whakamahia te tapawhā Punnett hei whakaatu i ngā tohuhema me ngā tohuira e tūmanakohia ana mō ngā uri katoa F_2 e taea ana mai i ēnei tipu F_1 e rua.

Ngā tohuhema F₁



(c) Homai te ōwehenga tohuāhua e tūmanakohia ana mō te whakawhiti kua oti i a koe.

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

ASSESSOR'S USE ONLY

QUESTION ONE: DIHYBRID INHERITANCE

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http://brian-howlett.blogspot.co.nz/2010/05/sweet-pea-purple.html

In the sweet pea plant, *Lathyrus odoratus*, the allele for purple (P) flower colour is dominant over the allele for red (p) flower colour. A second gene determines the shape of the pollen. Long (L) pollen is dominant over round (l) pollen.

(a) A purple, long-pollen plant, PPLL is crossed with a red, round-pollen, ppll plant.

Give the genotype of the F_1 generation:

Two F₁ generation plants were crossed to produce the F₂ generation plants.

(b) Use the Punnett square to show the gametes and the expected genotypes of all the possible F_2 offspring from these two F_1 plants.

		F ₁ gan	metes	
ı				
F ₁ gametes				
1 gametes				

(c) Give the expected phenotype ratio for the cross you have completed.

(d) Ina whakawhitia e ng \bar{a} kaim \bar{a} tai koiora ng \bar{a} tipu F_1 kia puta ai he uri F_2 , i kite r \bar{a} tou he rerek \bar{e} te \bar{a} wehenga tohu \bar{a} hua mai i te \bar{a} wehenga tohu \bar{a} hua i t \bar{a} manakohia i (c).

MĀ TE KAIMĀKA ANAKE

	Ōwehenga tohuāhua i kitea
Waiporoporo, roa (PpL1)	12
Waiporoporo, porohita (Pp11)	1
Whero, roa (ppL1)	1
Whero, porohita (pp11)	2

Ko tā rātou i whakarite ai kāore e wehea motuhaketia ana te ira tae me te ira hanga hae ki tērā i tūmanakohia; nō reira me hono ngā ira.

Matapakitia te take he aha i rerekē ai te ōwehenga tohuāhua tūmanako i tātaitia e koe ki te ōwehenga i āta kitea e ngā kaimātai koiora.

I tō whakautu:

- whakaahuatia tēnei mea te hononga
- whakamāramahia te take e kore ai ngā ira hono e wehewehe motuhaketia
- whakamāramahia he pēhea te whakawhitinga e whakanao tauhonohonotanga ai

matap waipo	pakitia he aha i puta ai i te whakawhitinga te iti o ngā oroporo me ngā tohuāhua hae roa whero.	i tohuāhua hae porohita

l wi
MĀ KAIM ANA

(d) When biologists crossed the F_1 plants to produce F_2 offspring, their observed phenotype ratio was different from the expected phenotype ratio in (c).

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	Observed phenotype ratio
Purple, long (PpL1)	12
Purple, round (Pp11)	1
Red, long (ppL1)	1
Red, round (pp11)	2

They concluded that the gene for colour and the gene for pollen shape were not independently assorting as expected; therefore the genes must be linked.

Discuss why the **expected phenotype** ratio you calculated is different from the **observed ratio** the biologists actually observed.

In your answer:

- describe linkage
- explain why linked genes do not assort independently
- explain how crossing over produces recombinants

•	discuss how crossing over resulted in the low occurrence of purple, round-pollen and red, long-pollen phenotypes.

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PĀTAI TUARUA: REREKĒTANGA

MA TE KAIMĀKA ANAKE

Ko te tohuāhua o ngā huruhuru o tētahi ngeru nā ngā ira rerekē, irarā rerekē hoki.

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

http://www.warrenphotographic.co.uk/29139-tabby-and-black-kittens

Ngo	i-ngātahi	Ngoi hukihuki		Tino ngoi	
BB	huruhuru pango	SS	huruhuru tāingoingo whānui	LL	huruhuru poto
Bb	pango me te parauri (tabby)	Ss	huruhuru tāingongo toharite	LL	huruhuru poto
bb	huruhuru pākākā	SS	kāore he huruhuru tāingoingo	11	huruhuru roa

(a) Whakamahia te papatau i runga ki te whakamārama he aha i puta ai i te ngoi-ngātahi, ngoi hukihuki, tino ngoi hoki ngā tohuāhua rerekē i roto i te ngeru.

Me uru ki tō whakautu:

- tētahi whakaahuatanga o te ngoi-ngātahi, ngoi hukihuki, me te tino ngoi hoki
- tētahi **whakamāramatanga** he pēhea e whakaputa ai ngā tohuira mō ia ira i ngā tohuāhua rerekē.

QUESTION TWO: VARIATION

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The phenotype of a cat's coat is determined by different genes and alleles.

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http://www.warrenphotographic.co.uk/29139-tabby-and-black-kittens

Co-c	dominance	Incomplete dominance		Complete dominance	
BB	black coat	SS	extensive spotting in coat	LL	short hair coat
Bb	black and tan coat (tabby)	Ss	medium spotting in coat	Ll	short hair coat
bb	tan coat	ss	no spotting in coat	ll	long hair coat

(a) Using the table above, explain why co-dominance, incomplete dominance, and complete dominance produce different phenotypes in cats.

In your answer include:

- a description of co-dominance, incomplete dominance, and complete dominance
- an explanation of how genotypes for each gene produce the different phenotypes.

10 Hua ai ngā puna rerekētanga i roto i tētahi puna ira¹ mai i ngā tukanga koioratanga pēnei i te (b) wehenga motuhake me te irakētanga. Matapakitia he pēhea e puta ai i te wehenga motuhake me te irakētanga te rerekētanga i roto i tētahi puna ira. I tō whakautu: whakaahuatia te wehenga motuhake me te irakētanga whakamāramahia te take ko ngā irakētanga te pūtake matua o ngā irarā hou i roto i tētahi taupori ME te take kāore te wehenga motuhake e whakauru irarā hou ki tētahi taupori whakatauritehia he pēhea e puta ai i te wehenga motuhake me te irakētanga te rerekētanga i roto i tētahi rauropi.

¹ matāira

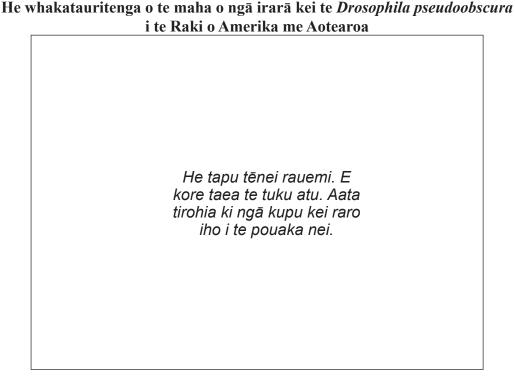
je/	cuss how independent assortment and mutation lead to variation within a gene pool.
	our answer:
ı y	describe independent assortment and mutation
	explain why mutations are the major source of new alleles in a population AND why independent assortment does not introduce new alleles into a population
	compare and contrast how independent assortment and mutation produce variation within an organism.

PĀTAI TUATORU: NGĀ PUNA IRA

MĀ TE KAIMĀKA ANAKE

He mea toiwhenua nō Amerika ki te Raki te rango hua rākau, *Drosophila pseudoobscura*. I urutomokia a Aotearoa e taua momo i roto i ēnei tau 50 kua hipa.

Kua kitea i roto i ngā tātaritanga ira inatata e whakataurite ana i ngā taupori o Amerika ki te Raki me Aotearoa he kaha te pānga whakaū o *D. pseudoobscura* e pūreirei haere ana i Aotearoa, otirā e 6 ngā mea takitahi i roto i te taupori taketake.



Reiland, J et al, Journal of Heredity, 2002, 93: 415-420

E whakaatu ana te taupori o Aotearoa he iti ake ngā irarā i ia pūwāhi ira i mātaihia.

Matapakitia he aha i whakaaturia ai e te taupori *D. pseudoobscura* kei Aotearoa te rerekēnga kētanga tino iti ina whakatauritea ki tērā o te taupori o Amerika ki te Raki.

Me uru ki tō whakautu:

- tētahi whakaaturanga o te pānga whakaū
- tētahi whakautu he pēhea te pānga o te **terenga iranga** ki te taupori o Aotearoa

whakatauritea ki te taupori o Amerika ki te Raki.				

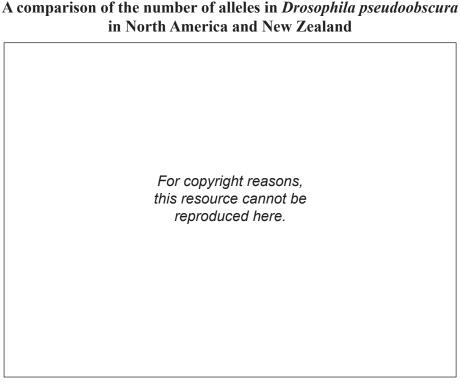
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QUESTION THREE: GENE POOLS

ASSESSOR'S USE ONLY

The fruit fly *Drosophila pseudoobscura* is endemic to North America. Within the last 50 years, the species has invaded New Zealand.

Recent genetic analysis comparing the North American and New Zealand populations has shown a strong founder effect of *D. pseudoobscura* colonising New Zealand, with 6 individuals in the founding population.



Reiland, J et al, Journal of Heredity, 2002, 93: 415-420

The New Zealand population shows fewer alleles at each gene locus studied.

Discuss why the New Zealand population of *D. pseudoobscura* shows such low genetic diversity compared to the North American population.

In your answer include:

- a description of the founder effect
- an explanation of how **genetic drift** has affected New Zealand's population

a discussion of why the New Zealand population has fewer alleles at each locus compared to the North American population.			

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TAU PĀTAI		Tuhia te (ngā) tau pātai mēnā e hāngai ana.
PATAI		

	Extra paper if required.	
QUESTION NUMBER	Write the question number(s) if applicable.	
NUMBER		

ASSESSOR'S USE ONLY

English translation of the wording on the front cover

Level 2 Biology, 2013

91157 Demonstrate understanding of genetic variation and change

9.30 am Friday 22 November 2013 Credits: Four

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 2–17 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.