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90459

NZQA
NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

For Supervisor's use only

Level 2 Biology, 2009

90459 Describe genetic variation and change

Credits: Three
2.00 pm Wednesday 18 November 2009

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 answer 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 2–8 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.

For Assessor's use only	**Achievement Criteria**	
Achievement	**Achievement with Merit**	**Achievement with Excellence**
Describe biological concepts and processes that relate to genetic variation and change.	Explain biological concepts and processes that relate to genetic variation and change.	Discuss biological concepts and processes that relate to genetic variation and change.
Overall Level of Performance		

You are advised to spend 35 minutes answering the questions in this booklet.

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QUESTION ONE

A new plant variety is established that shows variation in both the pattern of the veins and the lobe shape of the leaves. The genes controlling these features are located on different pairs of homologous chromosomes.

Plant A leaf with regular patterned veins and shallow lobes, RRdd.

Plant B leaf with irregular patterned veins and deep lobes, rrDD.

N. H. Giles (ed.), *The Science of Genetics: An Introduction to Heredity* (New York: The Macmillan Company, 1969), pp 73–74.

R = allele for regular patterned veins
r = allele for irregular patterned veins
D = allele for deep lobes
d = allele for shallow lobes

A plant with leaves that are regular and shallow, **RRdd**, is crossed with a plant with leaves that are irregular and deep, **rrDD**.

(a) Give the genotype of the F_1 generation. _____

Two of these F_1 plants are then crossed to produce the F_2 generation.

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

F1 gametes					
F1 gametes					

(c) Give the phenotype ratio for the cross you have completed.
Include a description of the appearance.

Phenotype ratio: _____

_____

_____

_____

The phenotype ratio in this cross is quite different from the genotype ratio.

(d) **Explain** why genotype and phenotype ratios can sometimes be different.
Use examples from parts (b) and (c) above to support your answer.

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(e) **Discuss** how a test cross can be used to **establish** true breeding plants with regular patterned veins, and deep lobes on the leaves.

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QUESTION TWO

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Discuss how and why the different processes that can occur during meiosis can lead to genetic variation between individuals.

Take into account the following:

- independent assortment
- segregation
- recombination / crossing over.

QUESTION THREE

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The **takahē** is a flightless bird native to New Zealand. Now there are less than 250 takahē, from a much larger population that was once found in many areas of New Zealand.

The **northern tuatara** is a native reptile of New Zealand, found on 29 islands with a population of over 60 000 individuals. In 2007, 130 were taken from one island to the predator-free Karori Wildlife Sanctuary in Wellington to set up a new population.

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Takahē

http://picasaweb.google.com/lh/photo/th3jgB28jjLWWXdiPLD-3w

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Tuatara

http://science.nationalgeographic.com/staticfiles/NGS/Shared/StaticFiles/Science/Images/Content/tuatara-reptile-708119-lw.jpg

Using the examples above, compare and contrast a population bottleneck with the founder effect, **and** discuss why genetic drift is likely to occur in **both** of these populations.

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Extra paper for continuation of answers if required.
Clearly number the question.

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Question number