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2

90459

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

Level 2 Biology, 2005

90459 Describe genetic variation and change

Credits: Three
2.00 pm Tuesday 15 November 2005

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: CELL DIVISION AND MUTATION

Shown below are four (4) gametes formed from the division of a single parent cell.

[FOR COPYRIGHT REASONS, THIS RESOURCE CANNOT BE REPRODUCED HERE. SEE BELOW.]

David Relph, Ron Pedder, Larry DeLacey, *Life Science*, Heinemann, Auckland, 1986, pp112-113

(a) Describe TWO features, **other** than four gametes, that indicate that this process is **meiosis**.

(b) The **chromosome number** of a species remains constant from one generation to the next. Describe how this is achieved in sexually reproducing species. Diagrams may be used to help answer this question.

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(c) Discuss how the processes of meiosis and mutation can contribute to genetic variation.

QUESTION TWO: DOG BREEDING

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Some dogs bark when working, others are silent. The barker (*B*) allele is dominant to the silent (*b*) allele. Tail shape is also controlled by a single gene. The allele for normal tail (*T*) is dominant to the allele for twisted tail (*t*).

A farmer has a litter of pups from a true breeding male dog, silent and with a normal tail, and a true breeding female dog, a barker with a twisted tail.

(a) Describe the genotype and the phenotype of the pups from these two dogs.

Genotype: _____

Phenotype: _____

One of the female pups from the litter is mated with a dog heterozygous for both genes.

(b) Use a punnet square to work out the **genotypes** of all the possible offspring from these two dogs.

Male Gametes

Female Gametes				

(c) Give the **phenotypic** ratio for the offspring in part (b) above.

_____

_____

(d) A farmer is considering using another barker dog with a normal tail for breeding. Discuss how he could determine the **genotype** of this dog and establish a true breeding group of normal-tailed dogs.

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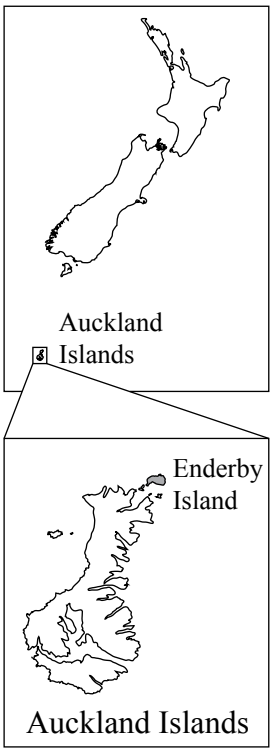
QUESTION THREE: ENDERBY ISLAND RABBITS



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Enderby Island is an island of a Sub-Antarctic group known as the Auckland Islands. The environment is cold, windy, and wet with a high humidity.

Enderby Island rabbits are considered the world's rarest rabbit breed. They have evolved from 12 English Silver Greys, which were released on to Enderby Island in 1865. The rabbits were able to thrive and multiply, and provided food for stranded sailors.

Over the past 129 years, the rabbit population has fluctuated between very low numbers and approximately 7000, depending on the available food and hunting.

Enderby Island rabbits are approximately half the size of Silver Greys and their coat is more open, longer and softer in texture. They are generally black or dark in colour.

In 1991 they were removed from the island to protect the natural environment.

The **founder effect** and **natural selection** have been important selection processes in the evolution of the Enderby Island rabbit.

(a) Two other selection processes that could be responsible for the genetic change in the Enderby Island rabbits are **genetic drift** and **bottleneck effect**.

Define these processes.

Process: Genetic drift

Definition: _____

_____

_____

_____

Process: Bottleneck effect

Definition: _____

_____

_____

_____

(b) **Discuss** how selection processes have led to the evolution of the Enderby Island rabbit.

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

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Question number	