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MANA TOHU MĀTAURANGA O AOTEAROA

Level 2 Biology, 2011

90459 Describe genetic variation and change

2.00 pm Friday 18 November 2011
Credits: Three

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 room for any answer, use the extra space provided at the back of this booklet.

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.

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 ☐		

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

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QUESTION ONE

Meiosis leads to variation in the offspring of plants and animals.

Discuss the three main processes that occur during meiosis: independent assortment, segregation, and recombination / crossing-over.

Your answer should include:

- a description of each process
- an explanation of how each process creates variation
- an evaluation of how each process contributes to the overall level of variation found in the gametes.

You may use diagrams to help with your answer.

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QUESTION TWO

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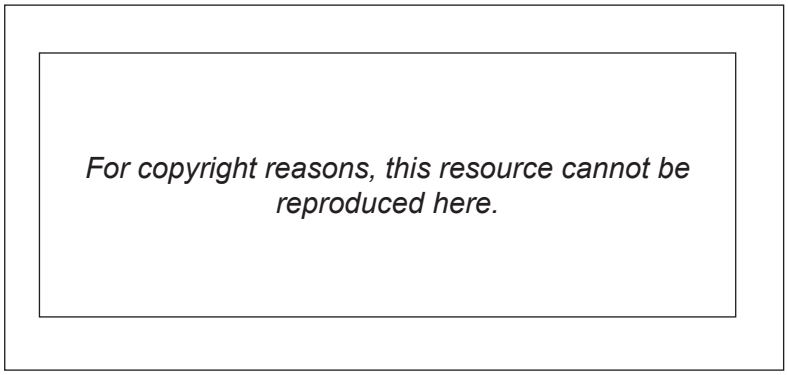

Image source: http://www.stonehavenfarm.com/images/ForIngridPainterCopy.jpg

In a particular breed of sheep, wool colour is determined by two pairs of genes: natural / domesticated and black / brown.

'Natural' sheep that have never been domesticated show a pattern of coloured wool on their heads and necks (collars) and white wool on their bodies. Most domesticated sheep show a solid colour throughout. The natural pattern (N) is dominant to the domesticated (n). Black (B) is dominant to brown (b).

A male sheep (ram) and a female sheep (ewe) that breed over several seasons produce offspring that show a 9:3:3:1 phenotypic ratio.

(a) State the genotypes of the male and female sheep, and use the Punnett square below to determine the phenotype of their offspring.

Male genotype: _____ Female genotype: _____

	F_1 gametes				
F_1 gametes					

(b) Describe the phenotype of the individuals for the given ratio 9:3:3:1.

9 = _____ 3 = _____

3 = _____ 1 = _____

(c) A breeder of this type of sheep wants to establish a flock (group of sheep) that all have the **'natural'** wool pattern with a **brown** collar.

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Discuss why the male and female sheep used in part (a) are not a suitable starting point for establishing this new flock, and how the breeder could determine which of his sheep were suitable.

In your answer you should refer to:

- the crosses that would have to be carried out
- the genotypes of the ram (male sheep) and ewe (female sheep) that would establish the flock that the breeder wants.

QUESTION THREE

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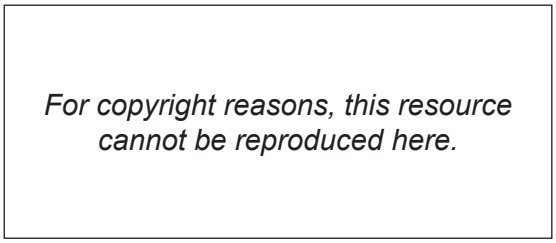
The Hawaiian island chain has formed from volcanic activity over a long period of time. The islands are arranged in a series, from the oldest (Kauai) to the youngest (Hawaii).

Differences that can be seen in most Hawaiian species and populations are in step-like progressions down the island chain, from the oldest to the youngest.

The species that show the greatest differences are on islands that have the greatest separation in both distance and time of formation.



www.gladtravel.com/img/HIpics/allislandsmaplarge.jpg

Discuss how **natural selection**, **migration**, **mutation** and the **founder effect** may have led to the variation seen in this isolated island chain.

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Extra space if required.
Write the question number(s) if applicable.

QUESTION NUMBER

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