91157

911570

NZQA
NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

2

SUPERVISOR'S USE ONLY

Level 2 Biology, 2014

91157 Demonstrate understanding of genetic variation and change

9.30 am Monday 17 November 2014
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 2–12 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.

TOTAL

ASSESSOR'S USE ONLY

QUESTION ONE: DIHYBRID INHERITANCE

ASSESSOR'S USE ONLY

In pumpkins or squash (*Cucurbita pepo*), white skin colour (W) is dominant to yellow skin colour (w) and disk-shape (D) is dominant to sphere-shape (d).

http://2.bp.blogspot.com/_Y-QcV-L6Xu4/TN85Q7UVWpI/AAAAAAAAA0U/VrYeexbOOjM/s1600/DSC08347.JPG

The genes controlling colour and shape in pumpkins are located on different pairs of homologous chromosomes.

A pumpkin homozygous for white skin colour and disk shape is crossed with a pumpkin homozygous for yellow skin colour and round shape. All the next generation pumpkins (F1) have the same genotype.

(a) Describe the **genotype** of the F1 generation. _____

(b) Two of these F1 pumpkins are crossed to produce the F2 generation.

Use the Punnett square to show the **gametes** and all the expected **genotypes** of all the possible F2 offspring.

F1 gametes

F1 gametes				

ASSESSOR'S USE ONLY

(c) Give the **phenotype ratio** for the cross completed in part (b) AND describe the appearance of each phenotype.

(d) Discuss how crossing over and linked genes affect genetic variation in a population.

In your discussion:

- describe what linked genes are
- describe the process of crossing over, including when it occurs
- explain the effect of crossing over on linked genes
- compare and contrast how both linked genes, and crossing over, affect genetic variation in a population.

You may draw diagrams to support your answer.

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

ASSESSOR'S USE ONLY

QUESTION TWO: NEW ALLELES

ASSESSOR'S USE ONLY

Pumpkins can grow in the wild. Wild pumpkins are usually round and have seeds in the centre. With the seeds being in the centre, when animals take a bite there is a high chance of seeds being eaten and then distributed.

Mutations can occasionally cause pear-shaped pumpkins to form. Pear-shaped pumpkins have seeds at only one end.

www.greenpatchseeds.com.au/vegetables2.html

(a) Define the term mutation.

(b) Gametic mutation leads to pear-shaped pumpkins.

Explain the process of gametic mutation including what it is, and where it occurs.

(c) Not all gametic mutations may enter the gene pool.

ASSESSOR'S USE ONLY

Discuss why the allele for pear-shaped pumpkin has not become established in the wild gene pool.

In your discussion:

- describe what a gene pool is
- explain the process of natural selection
- explain how natural selection influences allele frequencies in a gene pool
- discuss why the pear-shaped pumpkin allele has not become established in the wild gene pool through natural selection.

Justify your answer with reasons.

ASSESSOR'S USE ONLY

QUESTION THREE: CHANGES IN A GENE POOL

ASSESSOR'S USE ONLY

The lowland longjaw galaxias (*Galaxias cobitinis*) is New Zealand's rarest freshwater fish. It has been isolated from other galaxias species for millions of years and now is found only in a six kilometre stretch of the Kauru River, in North Otago.

For copyright reasons, this resource cannot be reproduced here.

Lowland longjaw galaxias.

www.niwa.co.nz/freshwater-and-estuaries/nzffd/NIWA-fish-atlas/fish-species/lowland_longjaw_galaxias

A change in allele frequency in a population can result in a new species forming from an ancestor species.

Discuss how genetic drift and migration can contribute to a change in gene pool and allele frequency in isolated populations, such as the lowland longjaw galaxias.

In your answer:

- describe the terms genetic drift, migration, and allele frequency
- explain how genetic drift and migration cause changes in allele frequencies
- discuss how genetic drift and migration affect the lowland longjaw galaxias's small population compared to a galaxias species with a larger population.

ASSESSOR'S USE ONLY

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

QUESTION NUMBER

ASSESSOR'S USE ONLY

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

QUESTION NUMBER

ASSESSOR'S USE ONLY

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

QUESTION NUMBER

ASSESSOR'S USE ONLY

91157