2

90459

904590

For Supervisor's use only

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

# Level 2 Biology, 2008

## 90459 Describe genetic variation and change

Credits: Three
2.00 pm Monday 17 November 2008

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 2–7 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.

Assessor's use only

## QUESTION ONE

During the process of meiosis, independent assortment and crossing over (recombination) can occur. This results in genetic variation in the offspring of sexually-reproducing individuals.

(a) **Describe** what happens during **independent assortment**.

(b) **Explain** how crossing over (recombination) can contribute to the genetic variation that results from sexual reproduction. You may use a diagram to help with your answer if you wish.

(c) Genetic variation can also result from mutation.

**Explain** the result of mutations in somatic and gametic cells.

## QUESTION TWO

In pea plants, two commonly studied features are the colour and the shape of the seeds. The genes controlling these features are located on different pairs of homologous chromosomes.

R = allele for round seeds
Y = allele for yellow seeds
r = allele for wrinkled seeds
y = allele for green seeds

A homozygous dominant pea plant, RRYY, is crossed with a homozygous recessive pea plant, rryy. All of the next generation plants ($F_1$) have the same genotype. Two of these $F_1$ plants are then crossed to produce the $F_2$ generation.

(a) Use the Punnett square to show the gametes and the **genotypes** of all the possible $F_2$ offspring from these two $F_1$ plants.
Make sure you write your letters clearly.

$F_1$ gametes

| | | | | |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

$F_1$ gametes

(b) State the appearance of the offspring AND give the phenotypic ratio for the cross you have completed:

Appearance ______________________________

Phenotypic ratio ______________________________

(c) A plant breeder wants to establish a population of pea plants that are **pure-breeding** for **wrinkled** and **yellow** seeds. The breeder has a stock of pea seeds of unknown genotypes that are all **round** and **yellow**.

Discuss the **genetics** involved in establishing the desired pure-breeding population from the stock seeds. Support your answer with the possible genotypes of the plants involved, using the letters for the alleles given on page 4.

## QUESTION THREE

Genetic biodiversity can change in a population, even though the size of the population remains fairly constant.

**Discuss** the factors that affect the frequency of alleles in the gene pool of a population. In your answer, consider:

- how alleles can enter the gene pool
- how alleles become established in, or eliminated from, the gene pool
- how the frequency of alleles in the gene pool can change over time.

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

Assessor's use only

Question number