

<b>Title</b>	<b>Explain genetic change</b>		
<b>Level</b>	<b>5</b>	<b>Credits</b>	<b>6</b>

<b>Purpose</b>	People credited with this unit standard are able to: describe the structure and function of a gene; explain mutation and variation; explain gene frequencies in a population; and describe aspects of genetic engineering.
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<b>Classification</b>	Science > Biology
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<b>Available grade</b>	Achieved
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### Guidance Information

None.

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### Outcomes and performance criteria

#### Outcome 1

Describe the structure and function of a gene.

#### Performance criteria

1.1 Genes are described in terms of their structure.

Range promoter, coding region, start codon, stop codon, introns, exons, genetic code.

1.2 Genes are described in terms of their cell functions.

Range replication, protein synthesis.

1.3 Gene fidelity is described in terms of DNA and RNA expression.

#### Outcome 2

Explain mutation.

#### Performance criteria

2.1 Gene mutations are explained in terms of the base sequence change and subsequent amino acid sequence alteration.

Range mutations – one substitution, one frame shift.

- 2.2 Effects of chromosomal mutations are explained in relation to the resulting phenotype.
- 2.3 Somatic and gametic mutations are explained in relation to the resulting outcomes.
- 2.4 Sources of mutations are identified in relation to their action on the DNA structure.
- Range endogenous cell processes, exogenous agents.
- 2.5 DNA repair mechanisms are explained in terms of their action to repair alterations to the DNA.
- Range evidence of three different mechanisms.

### **Outcome 3**

Explain variation.

#### **Performance criteria**

- 3.1 Variation resulting from sexual reproduction is explained in terms of processes.
- Range meiosis, fertilisation.
- 3.2 Phenotypic variation is predicted in relation to recessive and dominant genes.
- Range monohybrid crosses.
- 3.3 Variation of phenotypes is explained in terms of multiple gene interactions.
- Range epistasis, polygeny.
- 3.4 Meiotic mutations are explained in terms of chromosomal non-disjunction.
- Range aneuploidy, polyploidy.
- 3.5 Level of variation in populations is explained in terms of the heterozygosity and level of ploidy.

### **Outcome 4**

Explain gene frequencies in a population.

#### **Performance criteria**

- 4.1 The Hardy-Weinberg equation is explained in terms of defining gene frequency.
- Range one example to illustrate the Hardy-Weinberg equation.

4.2 Changes in gene frequency as identified by the Hardy-Weinberg equation are explained in terms of variation in the gene pool.

Range may include but is not limited to – industrial, forensic, medical, agricultural, horticultural.

4.3 Strategies for conserving genetic variation are explained in terms of a specific small population.

Range one each of – New Zealand indigenous plant, New Zealand indigenous animal.

## Outcome 5

Describe aspects of genetic engineering.

### Performance criteria

5.1 Mechanisms for producing variation are described in terms of genetic engineering.

Range may include but not limited to – tumour inducing plasmid, gene gun, restriction endonuclease.

5.2 The application of genetic engineering is described in relation to a specific example.

Range may include but is not limited to – industrial, forensic, medical, agricultural, horticultural.

5.3 Ethical implications of genetic engineering are described for a specific example.

**This unit standard is expiring. Assessment against the standard must take place by the last date for assessment set out below.**

### Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	22 December 1996	31 December 2014
Revision	2	19 February 1998	31 December 2014
Review	3	23 November 1999	31 December 2014
Review	4	21 May 2010	31 December 2022
Rollover	5	27 January 2015	31 December 2022
Rollover and Revision	6	15 June 2017	31 December 2022
Revision	7	26 October 2017	31 December 2022
Review	8	22 October 2020	31 December 2022

<b>Consent and Moderation Requirements (CMR) reference</b>	0113
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This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.

This unit standard is expiring