Title	**Demonstrate knowledge of gene structure, replication, and expression**		
Level	**5**	**Credits**	**5**

Purpose	People credited with this unit standard are able to: describe the structures and properties of nucleic acids; explain nucleic acid replication; discuss mutations; and discuss the regulation of gene expression.

Classification	Science > Molecular Biology

Available grade	Achieved

Guidance Information

None.

Outcomes and performance criteria

Outcome 1

Describe the structures and properties of nucleic acids.

Performance criteria

1.1 Ribonucleosides, nucleosides, ribonucleotides, and nucleotides are described in relation to nucleic acid structure.

1.2 Structure of DNA is described in terms of the Watson-Crick Model.

1.3 DNA is outlined in terms of tertiary structure and packaging.

Range supercoiled, open circular, chromosome.

1.4 Physical properties of DNA are described in terms of their applications.

Range viscosity, denaturation, melting temperature, buoyant density.

1.5 RNA structure and physical properties are described in terms of function.

Range messenger RNA (mRNA), transfer RNA (tRNA), ribosomal RNA (rRNA).

Outcome 2

Explain nucleic acid replication.

Performance criteria

2.1 Nucleic acid replication is explained in relation to DNA.

Range polymerases, DNA-binding proteins, origins of replication, ntermediate structures.

2.2 The role of reverse transcriptase is explained in relation to the replication of RNA retroviruses.

Outcome 3

Discuss mutations.

Performance criteria

3.1 Types of mutations are discussed in relation to genotypic and/or phenotypic implications.

Range spontaneous, induced, translocations, nonsense, missense, frameshift, silent, gene duplications.

3.2 Mutations are identified in relation to causative agents.

Range chemical, virus, radiation.

Outcome 4

Discuss the regulation of gene expression.

Performance criteria

4.1 Control of bacterial gene expression is discussed with reference to transcriptional control.

4.2 The structure of eukaryotic genes is discussed with reference to transcriptional control.

Range upstream regulatory sequences, enhancers, promoters, exons and introns, polyadenylation.

4.3 Mechanisms of gene regulation are discussed in terms of their differences.

Range two of – transcription factors, cell- and stage-specific, gene families, gene amplification, gene rearrangements, alternative RNA processing, mRNA stability.

Planned review date	31 December 2023

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
Review	2	23 November 1999	31 December 2014
Review	3	17 September 2010	N/A
Rollover	4	27 January 2015	N/A
Review	5	27 September 2018	N/A

Consent and Moderation Requirements (CMR) reference	0113

This CMR can be accessed at http://www.nzqa.govt.nz/framework/search/index.do.

Comments on this unit standard

Please contact NZQA National Qualifications Services nqs@nzqa.govt.nz if you wish to suggest changes to the content of this unit standard.