

Achievement Standard

Subject Reference	Biology 2.7		
Title	Demonstrate understanding of gene expression		
Level	2	Credits	4
		Assessment	External
Subfield	Science		
Domain	Biology		
Status	Registered	Status date	17 November 2011
Planned review date	31 December 2014	Date version published	17 November 2011

This achievement standard involves demonstrating understanding of gene expression.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
<ul style="list-style-type: none"> Demonstrate understanding of gene expression. 	<ul style="list-style-type: none"> Demonstrate in-depth understanding of gene expression. 	<ul style="list-style-type: none"> Demonstrate comprehensive understanding of gene expression.

Explanatory Notes

- This achievement standard is derived from *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007, Level 7. It is aligned with the following achievement objective in the Living World strand:
Evolution
 - Understand that DNA and the environment interact in gene expression and is related to the material in the *Teaching and Learning Guide for Biology*, Ministry of Education, 2010 at <http://seniorsecondary.tki.org.nz>.
- Demonstrate understanding* involves defining, using annotated diagrams or models to explain, and giving characteristics of, or an account of, gene expression.

Demonstrate in-depth understanding involves providing a reason as to how or why biological ideas and processes affect gene expression.

Demonstrate comprehensive understanding involves linking biological ideas and processes about gene expression. The explanation may involve justifying, relating, evaluating, comparing and contrasting, or analysing.
- Gene expression* involves a selection from the following biological ideas and processes:
 - nucleic acid structure and nature of the genetic code

- significance of proteins
 - protein synthesis
 - the determination of phenotype via metabolic pathways
 - effect of environment on genotype through mutations
 - effect of environment on expression of phenotype.
- 4 Biological ideas and processes relating to nucleic acid structure and nature of the genetic code are selected from:
- molecular components and their role in carrying the genetic code: nucleotide monomers, deoxyribose and/or ribose sugar, phosphate, nitrogenous bases, complementary base pairing resulting in coding and template strand
 - nature of the genetic code including triplets, codons and anticodons
 - redundancy due to degeneracy within the code.
- 5 Biological ideas and processes relating to the significance of proteins are selected from:
- proteins as the products of gene expression: DNA → mRNA → polypeptide or protein
 - identification of one gene → one polypeptide relationship
 - significance of proteins is limited to their structural and catalytic role in living things.
- 6 Biological ideas and processes relating to protein synthesis are selected from:
- the role of DNA sequence in determining the structure of a protein and how that protein is produced (transcription and translation)
 - the role of enzymes in controlling the process (specific names of enzymes are not required).
- 7 Biological ideas and processes relating to the determination of phenotype via metabolic pathways are selected from:
- biochemical reactions are catalysed by specific enzymes and every enzyme is coded for by a specific gene(s)
 - biochemical reactions do not occur in isolation but form part of a chain reaction so that the product of one becomes the substrate of another step in metabolism
 - phenotype is determined by the presence, absence, or amount of specific metabolic products.
- 8 Biological ideas and processes relating to the effect of the environment on genotype through mutations are selected from:
- mutagens (specific mutagens are recognised but their effect at molecular level is not required)
 - the potential effect on genotype and phenotype of gene mutations at the gene level.
- 9 Biological ideas and processes relating to the effect of environment on expression of phenotype involve ways that environmental factors may change phenotype without changing genotype.
- 10 Assessment Specifications for this achievement standard can be accessed through the Biology Resources page found at <http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/subjects/>.

Quality Assurance

- 1 Providers and Industry Training Organisations must have been granted consent to assess by NZQA before they can register credits from assessment against achievement standards.
- 2 Organisations with consent to assess and Industry Training Organisations assessing against achievement standards must engage with the moderation system that applies to those achievement standards.

Consent and Moderation Requirements (CMR) reference

0233