

91159



NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

2

SUPERVISOR'S USE ONLY

Level 2 Biology, 2016

91159 Demonstrate understanding of gene expression

9.30 a.m. Friday 18 November 2016
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of gene expression.	Demonstrate in-depth understanding of gene expression.	Demonstrate comprehensive understanding of gene expression.

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: NUCLEIC ACIDSASSESSOR'S
USE ONLY

- (a) Deoxyribonucleic acid (DNA) and ribonucleic acid (RNA) are both involved in protein synthesis.

Describe the structure of DNA and RNA.

You may use diagrams in your answer.



(b) DNA, mRNA, and tRNA are all involved in the formation of proteins.

Discuss the significance of these molecules in forming proteins, and why the cell continually makes mRNA molecules, but not DNA molecules, during protein synthesis.

In your answer include:


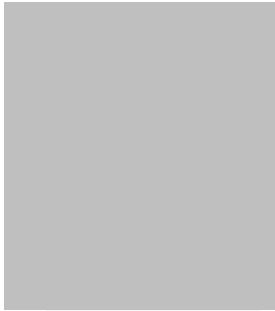
- an explanation of the function of DNA, mRNA, and tRNA molecules
- an explanation of how mRNA is produced
- a discussion of the significance of DNA, mRNA, and tRNA in forming specific proteins.

**This page has been deliberately left blank.
The examination continues on the following page.**

QUESTION TWO: ENVIRONMENTAL FACTORS AND GENE EXPRESSION

ASSESSOR'S
USE ONLY

The honey bee (*Apis mellifera*) has two female phenotypes.

Female type	Larvae Diet	Adult phenotype	Genotype
Queen bee 	royal jelly	<ul style="list-style-type: none"> • increased ovary size • large body mass • live for 2 years 	the same
Worker bee 	royal jelly for 3 days, then only pollen and honey	<ul style="list-style-type: none"> • infertile ovaries • smaller body mass • live for 3 – 6 weeks 	

www.britannica.com/media/full/171791/141787

(a) Describe the term gene expression.

(b) Explain why comparing worker and queen honey bee females is ideal for experiments on environmental factors and gene expression.

QUESTION THREE: MUTATIONSASSESSOR'S
USE ONLY

(a) Describe what a mutation is.

**Question Three continues
on the following page.**

- (b) There are over 1000 mutations that can cause cystic fibrosis. A common mutation is a deletion mutation that results in the absence of one amino acid in the final protein. Another mutation is a substitution mutation that results in a different amino acid in the final protein.

Discuss how these two mutations affect the cystic fibrosis gene's final protein and resulting phenotype.

In your answer include:

- an explanation of why the deletion mutation causes one amino acid to be absent in the final protein, and how this affects protein folding
- an explanation of why the substitution mutation causes a different amino acid to be present in the final protein, and how this affects protein folding
- a discussion of why the deletion mutation causes severe cystic fibrosis disease, whereas the substitution mutation causes milder cystic fibrosis disease.



Cystic
fibrosis
gene

Chromosome 7

