

National Certificate of Educational Achievement

2013 Assessment Report

Biology Level 2

- 91156 Demonstrate understanding of life processes at the cellular level**
- 91157 Demonstrate understanding of genetic variation and change**
- 91159 Demonstrate understanding of gene expression**

COMMENTARY

Successful candidates wrote clear, concise and accurate answers, using appropriate biological language and attempted all of the questions. They did not rewrite resource material already provided in the question and therefore avoided wasting time.

Candidates gaining Achievement, Merit, or Excellence correctly responded to the key words in the questions and addressed all bullet points provided with the question.

Candidates achieving higher grades seemed well prepared for the questions. Many candidates included examples (as asked by many questions in the papers) in their answers and directly linked them to the biological ideas or concepts, which helped to demonstrate their understanding by adding depth and detail to their responses. They also referred to the tables and graphs (resource material) in their answers to further illustrate their understanding. It was clear that many candidates were well prepared for the examination. They made good use of the resources such as exemplar materials, past year exam questions and schedules, including assessment specifications which are all available on the NZQA website.

Many candidates limited their level of achievement by providing responses that were not directly linked to the question. For example many candidates wrote about metabolic pathways in the 91159 paper when this was not specifically asked. Others provided responses that were simplistic and not at level 7 of the New Zealand Curriculum. Many candidates did not attempt all of the questions within each paper, nor gave examples when specifically asked to do so in the questions.

STANDARD REPORTS

91156 Demonstrate understanding of life processes at the cellular level

ACHIEVEMENT

Candidates who were awarded Achievement for this standard demonstrated the required skills and knowledge. They typically:

- described the cell processes of respiration, photosynthesis, cell division and DNA replication
- used correct biological terminology as required at level 7 of the NZ Curriculum
- described the structure and function of enzymes in cells
- supported their responses with correct labelled and annotated diagrams
- described the structure and function of cellular organelles such as mitochondria and chloroplasts.

NOT ACHIEVED

Candidates who were assessed as Not Achieved for this standard lacked some or all of the skills and knowledge required for the award of Achievement. They typically:

- used incorrect terminology
- provided responses below level 7 of the NZ Curriculum
- confused cellular processes e.g. cell division and DNA replication, respiration and photosynthesis

- provided biological information unrelated to the question
- provided incomplete or inaccurate information
- confused organelles and their functions.

ACHIEVEMENT WITH MERIT

In addition to the skills and knowledge required for the award of Achievement, candidates who were awarded Achievement with Merit typically:

- provided relevant examples to support their responses
- made links between structure and function
- provided reasons to support and link their descriptions.

ACHIEVEMENT WITH EXCELLENCE

In addition to the skills and knowledge required for the award of Achievement with Merit, candidates who were awarded Achievement with Excellence typically:

- provided multiple links between explanations
- provided in-depth response supported by multiple justified examples to illustrate the biological ideas.

STANDARD REPORTS

91157 Demonstrate understanding of genetic variation and change

ACHIEVEMENT

Candidates who were awarded Achievement for this standard demonstrated the required skills and knowledge. They commonly:

- recognised the difference between genotype and phenotype
- successfully completed a dihybrid Punnett square
- correctly defined or described some terms or used diagrams to show understanding, (from: linked genes, crossing over or independent assortment, mutation, recessive, dominant, heterozygous, complete dominance, co-dominance and incomplete dominance)
- recognised that 'phenotypic ratio' required identification of physical traits in addition to 9:3:3:1
- recognised that genetic drift was a result of random/chance events
- understood the significance of the small population on providing low genetic diversity and resulting in inbreeding
- defined founder effect or genetic drift.

NOT ACHIEVED

Candidates who were awarded Not Achieved for this standard lacked some or all of the skills and knowledge required for the award of Achievement. They commonly:

- provided responses below level 7 of the NZ Curriculum
- confused linkage with dominance and/ or crossing over
- provided 9:3:3:1 ratio numbers only, without naming the phenotypes

- failed to show understanding of a dihybrid cross
- confused co-dominance and incomplete dominance
- confused terms alleles and genes
- did not distinguish between independent assortment and crossing over
- confused genetic drift with migration or natural selection
- identified the founder effect as movement of 'alleles'.

ACHIEVEMENT WITH MERIT

In addition to the skills and knowledge required for the award of Achievement, candidates who were awarded Achievement with Merit commonly:

- recognised that linked genes were a short distance apart on the chromosome
- explained why linked genes cannot assort independently
- showed an understanding of the role of crossing over in breaking linkage
- explained how linkage and crossing over affect the new allele combinations in gametes
- explained crossing over correctly in terms of occurring between homologous chromosomes/non sister chromatids and of recombinants formed (or with a well annotated diagram)
- explained complete dominance, incomplete dominance and co-dominance using the cat examples
- recognised the importance of inheritance of alleles for addition to gene pool
- recognised that independent assortment produces (a range of) new combinations of chromosomes/ unique gametes and does not produce new information.

ACHIEVEMENT WITH EXCELLENCE

In addition to the skills and knowledge required for the award of Achievement with Merit, candidates who were awarded Achievement with Excellence commonly:

- compared independent assortment and crossing over with the recombination process in linked genes
- used well annotated diagrams showing how the linked genes could be separated by crossing over if they were far enough apart on the chromosome
- correctly identified factors that could influence the outcomes of the dihybrid cross due to linkage incorporating diagrams and clear explanations using relevant biological terms
- compared the difference between independent assortment and mutation in increasing variation in the gene pool/ within an organism
- were able to distinguish between the roles of somatic and gametic mutations
- discussed the significance of time and linked it to the low genetic diversity of the NZ fruit fly and compared it to the long established North American population
- discussed the significance of the low population size on the low genetic diversity of the NZ population and compared it to the large North American population
- used data from the table to support their answer (e.g. RUNT locus has only 10 alleles in the NZ population compared to 20 in the NA population)
- compared the allele frequency in the NZ and North American populations through explanations of the loss of alleles and the effect of drift.

STANDARD REPORTS

91159 Demonstrate understanding of gene expression

ACHIEVEMENT

Candidates who were awarded Achievement for this standard demonstrated the required skills and knowledge. They commonly:

- described key terms used in the question such as mutagen, phenotype and non mutagenic environmental factor
- used correct biological vocabulary in their answers
- addressed most bullet points in their answers
- gave a simple example of an environmental factor changing phenotype
- used a codon table to determine the mRNA codons and DNA triplets needed to produce an amino acid sequence
- provided an example of redundancy from the codon table
- defined redundancy correctly
- described basic functions and/or structures of the molecules involved in protein synthesis e.g. DNA, mRNA, tRNA, ribosome
- defined the three different kinds (substitution, deletion, insertion) of mutation
- described the difference in inheritance between somatic and gametic mutations
- gave an example of a non inheritable mutation
- understood the difference between nucleotide, codon, anti-codon, template strand, coding strand, DNA triplet, and amino acid.

NOT ACHIEVED

Candidates who were awarded Not Achieved for this standard lacked some or all of the skills and knowledge required for the award of Achievement. They commonly:

- provided responses below level 7 of the NZ Curriculum
- believed that organisms **adapt** to a new environment genetically within their own lifetime
- restated a lot of the resource material rather than answer the question
- confused mutagen with mutation
- failed to link environmental factor to its effect on the organism
- failed to use armadillo example
- suggested that multiple environmental factors be tested in one armadillo experiment
- failed to describe protein synthesis accurately.

ACHIEVEMENT WITH MERIT

In addition to the skills and knowledge required for the award of Achievement, candidates who were awarded Achievement with Merit commonly:

- showed a clear understanding and gave examples and linked to DNA, gene expression, and environmental effects
- used correct biological terms in their answers and addressed all bullet points

- gave simple examples of an environmental factor that changed phenotype, supported by biological reasons
- gave specific examples of environmental factors and their effect on the armadillo/organism
- defined redundancy AND provided a specific example from the table
- gave a detailed explanation of the structure and function of at least two molecules/organelles involved in protein synthesis
- accurately explained at least two steps involved in protein synthesis
- explained the effect of substitution and deletion/insertion mutations
- named generic examples of conditions caused by non-inherited mutations
- explained inheritance patterns of somatic and gametic mutations
- described how a recessive condition is passed through generations.

ACHIEVEMENT WITH EXCELLENCE

In addition to the skills and knowledge required for the award of Achievement with Merit, candidates who were awarded Achievement with Excellence commonly:

- gave an example of a study that compared a control group with an experimental group
- linked specific environmental factors with specific phenotype changes along with reasons for the changes (e.g. high temperature affecting enzyme function which affects pigment production)
- linked the significance of the genetically identical armadillos to their usefulness to the study
- explained the steps of protein synthesis with accuracy, correctly naming all structures and molecules
- explained the relationships between codon/anti codon and mRNA/tRNA with accuracy
- explained the function of mRNA, tRNA, ribosome, and DNA
- compared the inheritance patterns of somatic and gametic mutations
- named specific examples of conditions caused by non-inheritable mutations
- discussed how a recessive condition is passed through generations and what genotype is needed for it to be expressed.