National Certificate of Educational Achievement

2012 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

New standards were examined for the first time in 2012, and it was clear that whilst many candidates had been well prepared for the examination of these standards, a large number had not. Many answered questions with responses that suggested teaching had been aligned with previous standards.

Successful candidates wrote clear, concise and accurate answers, using appropriate biological language. They did not rewrite resource material already provided in the questions and therefore avoided wasting time. More importantly, they made an effort to answer all of the questions in each examination, ensuring that they gained marks that reflected a broad understanding of the standard(s).

Candidates gaining Achievement, Merit or Excellence correctly responded to the key words (in bold) in the questions. Most candidates demonstrated a clear understanding of the terms used to differentiate the grades as defined in the achievement standards. Better-performing candidates seemed well prepared for the current style of questions which all assess to Excellence level. Many good candidates included examples in their answers that directly linked to the biological ideas or concepts, which helped to show their understanding. It was clear that many candidates had prepared well for the examinations by looking at the exemplar papers, scripts and published schedules available on the NZQA website.

Many candidates limited their level of achievement by providing responses that were not directly linked to the question being 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, or gave examples that were out of context to the questions, and could therefore not be used towards any level of achievement. Many candidates did not attempt even basic answers for the questions and therefore missed opportunities to provide evidence that could have contributed to an Achievement grade. In multi-part questions, many candidates failed to answer all of the parts, again limiting their opportunity to gain credit for their understanding.

Many candidates did not use simple annotated biological drawings to demonstrate knowledge or to help illustrate an answer, even when it was suggested and a space was provided to do so.

An inability to define or describe key terms as listed in each standard was a major issue for a number of candidates. Familiarity with the terms listed in a standard gives a student the framework on which to build an answer in any of the examinations.

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 biological terms such as photosynthesis, diffusion, osmosis, active transport, passive transport, enzyme, DNA replication
- described cell processes such as photosynthesis, movement of materials into, out of and within cells, DNA replication and enzyme activity

- described how factors affect the rate of the life processes at a cellular level e.g. how a change in temperature, pH or concentration affects the rate of enzyme activity, how a change in light intensity results in a change in the rate of photosynthesis
- provided appropriate and relevant examples.

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:

- listed rather than described ideas
- provided inaccurate descriptions, or descriptions below L7 of the curriculum such as: increased temperature kills enzymes, photosynthesis is a process that makes energy, diffusion occurs only in gases
- provided insufficient evidence of relevant, accurate examples e.g. described the function of the contractile vacuole expelling water as an example of osmosis
- described life processes at the organ or whole organism level rather than at the cellular level
- did not differentiate correctly between active transport and passive transport
- confused biological ideas about life processes at a cellular level e.g. confused the process of photosynthesis with the process of respiration, co-enzymes and enzyme poisons, osmosis with osmoregulation, DNA replication and protein-synthesis.

ACHIEVEMENT WITH MERIT

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

- explained how a change in factors affects life processes e.g. provided reasons for why or how a change in season may affect the rate of photosynthesis
- provided detailed, well explained examples to support their responses
- explained similarities or differences in the ways materials are moved at a cellular level
- provided reasons for the distribution of chloroplasts in plant cells
- explained DNA replication in relation to the role of enzymes in the process
- explained photosynthesis in relation to reactants, products, chloroplast structure and reasons for the change in the rate of the process.

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:

- accurately compared and contrasted processes at the cellular level such as diffusion, osmosis and active transport
- provided in-depth and multiple examples to support their responses
- linked multiple, detailed ideas to life processes at a cellular level
- integrated detailed examples with the accurate explanations of the different types of transport
- discussed how enzyme action was related to DNA replication, including how factors affect these enzymes.

91157 Demonstrate understanding of genetic variation and change

ACHIEVEMENT

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

- defined key terms
- completed a Punnett square correctly
- distinguished between biological terms (e.g. somatic from gametic)
- identified a phenotype from a genotype
- demonstrated knowledge of phenotype ratio
- recognised the differences between two factors that contribute to changes in gene pools.

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:

- repeated the question within their answer
- didn't attempt all parts of the question
- confused terms (e.g. migration, genetic drift and natural selection)
- were unable to complete the Punnett square
- gave information which was biologically correct but not relevant to the question
- gave random examples that had nothing to do with New Zealand
- used terms incorrectly (e.g. species, individuals, populations, communities).

ACHIEVEMENT WITH MERIT

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

- made attempts to back up explanations with examples
- showed clear understanding of the three phenotypes' dominance over each other
- understood the importance of individuals needing to survive and reproduce to pass on favourable alleles
- used a New Zealand example to explain processes involved in changes to gene pool.

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:

- linked concepts and processes fully and backed up explanations with relevant examples
- identified factors that could hinder a gametic mutation entering the gene pool
- showed links between terms (genetic drift, natural selection, migration) and how a named species could be subjected to all of these through time
- provided clear links in their discussion of why there is only one parental genotype combination to provide each of the offspring phenotypes.

OTHER COMMENTS

The importance of students attempting all questions did not seem to have been stressed to a number of candidates.

91159 Demonstrate understanding of gene expression

ACHIEVEMENT

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

- defined key terms within the question including those that were in bold or specified within bullet points
- gave simple examples of these key terms – such as UV light as a mutagen
- applied descriptions of their understanding that were specific to the standard rather than biologically correct responses that were related only to other standards
- ensured that most of the questions' requirements were covered in their responses
- used appropriate standard-specific vocabulary outside of the format of the question, (i.e. did not simply rephrase the question in their response).
- attempted all parts and all questions
- described the process of protein synthesis clearly and in a logical sequence.

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:

- included content in their response that was not standard specific, such as discussing non-genetic factors that affect enzyme action and/or natural selection
- provided responses that included many key terms, such as those provided in the question, but failed to describe these correctly or provide acceptable definitions for them
- confused some key terms such as mutation and mutagen
- confused processes such as transcription and translation or translation and DNA replication
- were unable to provide examples of key ideas such as environmental factors, mutagens and mutations
- were unable to distinguish between mutagens and non-mutagens as environmental factors.

ACHIEVEMENT WITH MERIT

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

- made clear links between the base sequence and protein validity or genotype/phenotype
- explained examples of environmental factors with clarity, regarding the way they affected the organism
- showed understanding of the difference between environmental mutagens and other environmental factors that can affect phenotype but not genotype

- demonstrated some understanding that the code in mRNA indirectly determines the sequence of amino acids via the link with tRNA
- understood the term degeneracy and the reasons for it occurring
- made some links between their responses and the context of the question.

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:

- showed understanding of the relationship between mRNA, tRNA and the amino acids, and applied this understanding in a clear and cohesive manner
- demonstrated a comprehensive understanding of the link between genotype and phenotype and/or base sequence to amino acid sequence/protein
- consistently referenced examples and context within their responses
- compared the effect of mutagens against the effects of other environmental factors.