2025 NCEA Assessment Report

Subject: Biology

Level: 2

Achievement standard(s): 91156, 91157, 91159

General commentary

The question style throughout all three standards allowed candidates to demonstrate their understanding of biological concepts using appropriate terminology. Candidates who explained biological processes and accurately defined key terminology were awarded higher grades. Candidates are encouraged to avoid giving broad or generalised descriptions of concepts, instead focusing on the specific ideas being assessed.

Most successful candidates completed all three questions within each standard and made deliberate attempts to engage with the supporting bullet points. Candidates who effectively integrated information from the resource material to connect biological ideas produced stronger, more coherent answers.

Candidates who achieved at higher levels consistently provided relevant detail beyond what was included in the resource material, demonstrating a deeper and more comprehensive understanding.

Report on individual achievement standard(s)

Achievement standard 91156: Demonstrate understanding of life processes at the cellular level

Assessment

The assessment was comprised of three questions, and the candidates were required to respond to all of them. The questions required candidates to apply their understanding of life processes at the cellular level. The questions covered the requirements of the 2025 assessment specifications, which included, with the contexts provided: photosynthesis, respiration, and enzyme activity. Answers covered both the biochemical processes involved and the significance of these processes to cellular function.

Commentary

Candidates who engaged with the resource material and framed their responses within the context of the question were more likely to achieve higher levels. In contrast, some candidates demonstrated only a partial understanding of biological concepts, often using incorrect or inappropriate terminology when explaining biological processes. Several responses included information that, while related to biology, fell outside the scope of what the question required and therefore could not be credited. Additionally, candidates who did not incorporate the resource material into their answers limited their ability to fully address the assessment criteria, which reduced their overall achievement.

Grade awarding

Candidates who were awarded **Achievement** commonly:

- identified the products and reactants for photosynthesis, and aerobic and anaerobic respiration
- defined the biological terms involved in this standard (photosynthesis, aerobic and anaerobic respiration, as well as photosynthesis phases, enzymes, active sites)
- presented a diagram of an enzyme and an enzyme substrate complex
- gave the location of the different stages of photosynthesis and stated the use of chlorophyll in photosynthesis
- identified the locations of aerobic and anaerobic respiration
- listed the advantages and disadvantages of both aerobic and anaerobic respiration
- described an effect of different temperatures on enzyme activity.

Candidates who were awarded **Achievement with Merit** commonly:

- explained the steps involved in different phases of photosynthesis
- explained the role of light intensity, temperature, and carbon dioxide availability on the rate of photosynthesis
- provided explanation of aerobic and anaerobic respiration, as well as advantages and disadvantages of each
- outlined how enzyme–substrate complexes form and explained how temperature affects enzyme action through changes in kinetic energy and collision frequency
- gave details on why a high or low temperature will affect the rate of enzyme activity
- demonstrated understanding of the functions of different parts of the mitochondria
- connected the changes in temperature or light intensity with specific times of the day and effect on rate of photosynthesis.

Candidates who were awarded **Achievement with Excellence** commonly:

- referenced resource material to illustrate their understanding of the phases of photosynthesis
- justified the impact of different environmental factors on the overall rate of photosynthesis
- linked resource information with their understanding of energy demand to explain why aerobic and anaerobic respiration are beneficial at different times in each context
- compared and contrasted the processes, benefits, and limitations of both aerobic and anaerobic respiration
- elaborated on enzyme structure, function, and the impact of temperature changes on the rate of reaction
- linked the rate of enzyme action to environmental conditions, including temperature and significance of activity rates to biological processes.

Candidates who were awarded **Not Achieved** commonly:

- mixed up photosynthesis and aerobic / anaerobic respiration
- provided a limited number of reactants or products for photosynthesis and aerobic / anaerobic respiration
- misidentified the cytoplasm as the site of photosynthesis and stomata as the site of anaerobic respiration
- did not identify an enzyme's active site
- described the impact of enzyme inhibitors and co-factors, which was not included in the question.

Achievement standard 91157: Demonstrate understanding of genetic variation and change

Assessment

The assessment included three questions relating to biological principles of genetic variation and change. Each question included key bullet points designed to guide candidates in structuring their responses and identifying the information required to meet the achievement criteria.

Candidates were required to respond to all three questions, applying their understanding of how linked and unlinked genes can affect genetic variation. The assessment also focused on processes of crossing over and how segregation can influence inheritance patterns. Candidates were expected to demonstrate their understanding of how migration, founder effect, population bottlenecks, and mate selection can impact allele frequencies in a gene pool. The questions also assessed understanding of patterns of inheritance, which included multiple alleles, complete dominance, co-dominance, and dihybrid crosses.

Commentary

Candidates who tailored their responses directly to the demands of each question tended to achieve at higher levels. In contrast, candidates who demonstrated only a limited grasp of key biological ideas, often misused biological vocabulary or selected terminology that was inappropriate for the processes being described. Candidates are encouraged not to omit key concepts such as the distinction between dominant and recessive. Candidates should also ensure that they are responding to all parts of the question to achieve high grades.

Grade awarding

Candidates who were awarded **Achievement** commonly:

- identified the correct gametes and accurately completed Punnett squares, including those showing the possible genotypes for Child 1
- accurately stated the subsequent ratios for phenotype for the F2 generation
- provided clear definitions for linked genes (located close on the same chromosome) and unlinked genes (on different chromosomes or far apart on the same chromosome)
- defined biological terms such as crossing over, segregation, and natural selection
- presented description of terminologies such as gene pool, allele frequency, genetic drift, multiple alleles, complete dominance, and co-dominance.

Candidates who were awarded **Achievement with Merit** commonly:

- provided detail of the process of crossing over and segregation using the idea that alleles were reshuffled and new combinations were created, or that gametes were unique to each other and the parents
- explained the effect of crossing over on linked and unlinked genes on the same chromosome
- explained the effect of segregation on linked and unlinked genes
- explained the effect of genetic drift on a small population
- explained natural selection in relation to the increase or decrease in allele frequency of the beneficial / non-beneficial allele or phenotype
- explained the effect of selection pressures on the different phenotypes for the two environments
- accurately defined complete and co-dominance and explained using the blood groups as examples.

Candidates who were awarded **Achievement with Excellence** commonly:

- discussed the ratios for both of the snakes in relation to the idea of linked and unlinked genes
- discussed the specific ratio regarding the frequency of crossing over for linked and unlinked genes on the same chromosome
- explained that gametes passed on by either Child 1or partner and linked this to the phenotype and genotype ratio obtained for the offspring
- linked the idea of a test cross to the ratios observed for the genotype of the offspring to discuss the degree of uncertainty involved in the guarantee of Child 1's genotype.

Candidates who were awarded **Not Achieved** commonly:

- provided incorrect definitions
- could not give the gametes and complete the Punnett square correctly
- did not recognise that unlinked genes could also be on the same chromosome but located far apart
- demonstrated incorrect understanding of concepts such as natural selection and genetic drift
- did not show understanding of the concept of multiple alleles.

Achievement standard 91159: Demonstrate understanding of gene expression

Assessment

The assessment included three questions relating to the biological principles relating to gene expression. Candidates were required to answer all three questions and apply their understanding of:

- substitution mutations
- transcription and translation
- how mutations and environmental factors affect a chlorophyll metabolic pathway.

Commentary

Candidates were awarded higher grades when they could link mutations to final protein structure and function and then further linked the mutations to cystic fibrosis symptoms. Most candidates presented explanations of how the substitution mutations changed the amino acid sequence but did not include information on other amino acids and the unchanged length of the polypeptide chain.

To achieve higher grades, candidates should present thorough explanations of the importance of transcription and translation. Candidates should ensure that they connect transcription and translation to the explanation for why DNA cannot be directly translated into a polypeptide chain. Many candidates only restated information from Question Three and did not explain the metabolic pathway.

Candidates should clearly explain the link between genes and enzymes or recognise magnesium as an environmental factor affecting enzyme 2's function and connect this to chlorophyll production.

Grade awarding

Candidates who were awarded **Achievement** commonly:

- identified the two mutations in the table as substitution mutations while accurately defining the concept
- identified that the mutation in the question did not cause a frame shift
- identified the severity of the mutations

- described the function of mRNA and tRNA along with identification and labelling of DNA template and mRNA strand
- outlined transcription and translation
- described a metabolic pathway
- described enzymes as biological catalysts and identified that genes code for enzymes
- described what a final product is
- described that genes and the environment interact to produce a phenotype.

Candidates who were awarded **Achievement with Merit** commonly:

- identified the specific substitution mutations (e.g. mutation 1 is a silent / same sense mutation and mutation 2 is a missense mutation) and how these affected the amino acid sequence
- explained redundancy of the code and linked to silent mutations
- explained substitution mutations do not change the stop codon / length of the amino acid sequence
- explained the function of mRNA
- recognised the complementary nature of codons and anticodons
- explained the relationship between the two genes, two enzymes, and three molecules for the specific metabolic pathway in the question
- identified that gene 1 or gene 2 is mutated, which means enzyme 1 or enzyme 2 is not working, therefore chlorophyll is not made / leaves are yellow (chlorosis)
- explained how magnesium prevents enzyme 2 from 'working' / catalysing of intermediate (linked to functionality of enzyme 2) substrate into chlorophyll
- explained how mutations to either (or both) gene 1 or 2 affects their respective enzyme 1 or 2 and the production of chlorophyll.

Candidates who were awarded **Achievement with Excellence** commonly:

- discussed the effect of the substitution mutations from the table and linked them to the amino acid sequence, shape of the final protein, functioning, and symptoms of cystic fibrosis
- discussed the relationship between codons, anticodons, tRNA, mRNA, and amino acids
- showed comprehensive understanding of a specific metabolic pathway, including how yellow leaves (chlorosis) can be caused by mutations in gene 1 or 2, or both.

Candidates who were awarded **Not Achieved** commonly:

- answered only some of the questions
- presented inaccurate definitions or descriptions of key biological concepts
- did not describe mutations or identify the substitution mutations
- did not show understanding of transcription or translation.