

This assessment report is based on assessments for 2023. It may not reflect achievement standards that have been updated.

2023 NCEA Assessment Report

Subject:	Chemistry and Biology (RAS)
Level:	Level 1
Achievement standard(s):	92022, 92023

Report on individual achievement standard(s)

Achievement standard 92022: Demonstrate understanding of genetic variation in relation to an identified characteristic

Assessment

This externally marked assessment was a report produced individually by candidates in response to one question consisting of two parts.

Part one asked candidates to discuss genetic variation in populations of a species they had studied. In the second part, a context of kākāpō conservation was given along with some information, and candidates responded to this, evaluating the effectiveness of the genetic tracking that scientists have undertaken, as part of the kākāpō conservation programme.

The question required candidates to apply their understanding of genetic variation in relation to two identified characteristics – one that they had studied during the year, and one that was provided in the assessment task.

The question covered biological concepts from the achievement standard such as sources of genetic variation and why this variation occurs, and tracking genetic relationships using DNA markers.

Commentary

Candidates who explained their ideas, using either the kākāpō example or examples from their own context, achieved well. Comprehensive evidence, with accurate use of terminology and clear examples to highlight understanding of biological ideas led to Achievement with Excellence. All candidates needed to be able to identify and define biological terms relevant to the task and use them accurately in their report.

A common misconception candidates demonstrated was that a disease / genetic disorder is inherited, rather than an allele coding for a disease / disorder being inherited. Whether or not the individual inheriting the allele develops the disease / disorder depends on the genotype and whether the allele is dominant or recessive. Or, in the case of the CDH1 mutation, which increases your chances of developing cancer (or a disease / disorder).

The report required for the assessment could be written or oral, with a recommended word count of 800 words or 3–4 minutes audio. All candidates submitted written reports in 2023. Very little was written about what a genetic marker is and how it is useful in the context of conservation.

Candidates attempted to write about concepts at a higher level of the curriculum than expected (such as trying to explain independent assortment and crossing over). It appeared that many candidates had memorised the steps of crossing over, independent assortment, and segregation, but did not link this to the idea that meiosis produces genetically unique gametes.

Grade awarding

Candidates who were awarded **Achievement** commonly:

- answered both parts of the question, addressing each bullet point
- defined key biological terminology related to the question (e.g. genotype, phenotype, mutation, sexual reproduction, genetic variation, and genetic marker).

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

- answered both parts of the question thoroughly, addressing each bullet point
- explained that mutations need to be inherited through gametes to be passed onto offspring
- explained how the production of genetically unique gametes through meiosis combined with random fertilisation during sexual reproduction leads to variation in the next generation.

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

- answered both parts of the question thoroughly, addressing each bullet point
- linked sexual reproduction and the two alleles in the genotype of offspring coming from each parent to the possible phenotypes depending on the alleles inherited and therefore the chance of offspring displaying the studied characteristic
- discussed possible inheritance of a particular characteristic using punnet squares to show their thinking
- discussed genetic relationships using punnet squares and phylogenetic trees to show thinking.

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

- described the stages of meiosis, often in detail (this was not asked for in the task and was not awarded marks)
- stated that a dominant allele was more likely to be inherited
- stated that inbreeding (breeding closely related individuals) increases mutation rate
- described sexual reproduction as sexual intercourse, missing the opportunity to discuss the creation and fusion of gametes
- confused biological ideas between sexual reproduction and meiosis (e.g. describing meiosis happening in the zygote, fertilisation happening before meiosis, sexual reproduction being meiosis, meiosis happening during sexual intercourse, sexual reproduction happening before meiosis)
- used the terms gene and allele incorrectly by using one to mean the other
- stated that genetic tracking was used to identify gene variations that impact health or reproduction, rather than genome sequencing
- discussed valid conservation measures (in part b) that did not relate to genetic variation, so were not awarded marks for this.

Achievement standard 92023: Demonstrate understanding of how the properties of chemicals inform their use in a specific context

Assessment

The online examination consisted of one question. The context of the question examined the properties of three of the four types of substances (ionic, metallic, covalent network) used in a smartphone. Relevant data was attached to question parts to enable candidates to evaluate what substance to use for a particular purpose. A periodic table was supplied.

Commentary

To analyse two or more substances, candidates needed to use all the data provided to support their comparisons and ensure their answer linked back to its use in the specific context.

The ability to recognise and describe the structure of metallic, ionic, molecular, and covalent network solids correctly was a key skill for this standard and was important for all levels of achievement. Linking the structure of chemicals and their physical properties to a context required correct and precise use of science terminology.

Grade awarding

Candidates who were awarded **Achievement** commonly:

- identified the type of chemical substance
- recognised that delocalised / free-moving electrons conduct electricity in a metallic substance
- provided an accurate definition for an alloy
- described relevant physical properties of the chemical substances
- named the particles present in metallic, ionic, molecular, and network solids, and described their structure
- identified the most suitable chemical substance for a given context based on data provided.

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

- compared the physical properties of chemical substances based on the data provided
- linked the structure of ionic solids, strength of attractive forces, and particle movement to electrical conductivity
- linked the structure of metallic substances, strength of attractive forces, and electron free movement to physical properties
- linked melting points, electrical conduction, or thermal conductivity of metallic substances to the context
- linked the structure of diamond or graphite to conductivity
- linked the physical properties of an alloy to its use.

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

- provided data to support their answer and make comparisons
- compared the physical properties of chemical substances based on data provided and linked to their use in a context

- linked electrical conductivity in terms of structure and free movement of electrons / ions correctly to the context
- linked the structure of metallic substances, strength of attractive forces, and electron free movement to physical properties and use in a given context
- linked the structure, strength of attractive forces, and movement of particles in diamond and graphite to their physical properties and their use in the given context
- linked the structure of solid ionic substance and aqueous ionic substance to the inability or ability to carry a charge
- compared physical properties of alloys and suggested one alloy for use in a given context.

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

- confused ionic substances with polar molecules
- confused covalent network substances with covalent molecular substances
- seemed to find exponents confusing
- stated only a few of the types of particles and attractive forces present in metallic, ionic, and network solids
- used only some chemistry terminology correctly
- confused melting points and thermal conductivity
- discussed economic concepts of materials rather than relating use to the chemical structure.