

2024 NCEA Assessment Report

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| Subject: | Physics |
| Level: | 2 |
| Achievement standard(s): | 91170, 91171, 91173 |

General commentary

The use of previous examinations as study material was evident in many candidate responses. However, to gain credit, candidates needed to ensure responses were adapted to the current year's context.

Well-presented handwriting and clearly labelled calculations give candidates a better chance of showing their understanding.

Candidates need to ensure they answer all parts of a question.

Candidates should only round answers at the last step in a multi-step calculation.

Report on individual achievement standard(s)

Achievement standard 91170: Demonstrate understanding of waves

Assessment

The examination consisted of three questions. Question One examined waves in water and pulses. Question Two examined mirrors and lenses. Question Three examined light and interference.

Grade awarding

Candidates who were awarded **Achievement** commonly:

- knew basic definitions
- could substitute into equations and solve for the required variable
- were confused over the use of correct terminology
- forgot arrows on ray diagrams.

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

- used definitions and terminology correctly in most cases
- could draw ray diagrams for lenses and mirrors correctly and not mix up the two
- could solve two-step equations.

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

- answered all parts of each question fully and had good overall knowledge of the entire standard
- wrote answers that were both concise and accurate, linking explanations back to the context of the question rather than giving 'rote learned' statements
- were able to complete multi-step calculations, giving correct units and significant figures
- drew ruled, accurate ray diagrams and elaborated on the meaning and relevance of other diagrams required.

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

- struggled to identify which physics phenomena were needed for the different contexts
- had difficulty drawing appropriate diagrams
- found simple calculations difficult and often did not complete them, if started at all
- showed very little knowledge of light or waves in general.

Achievement standard 91171: Demonstrate understanding of mechanics

Assessment

The examination consisted of three questions. Question One examined momentum and circular motion. Question Two examined springs, work, power, energy, and equilibrium. Question Three examined motion with constant acceleration.

Commentary

Candidates were generally well prepared in that their responses to the examination and showed a good level of understanding, with clear differentiation between understanding, in-depth understanding, and comprehensive understanding.

Some candidates did not realise that Q1(a) and Q2(a) required force diagrams – it appeared that they thought these were merely illustrations.

Performance could improve if candidates realised the importance of reading questions carefully to ascertain what is being asked, as correct physics is not rewarded if out of context.

Candidates were mostly able to select a correct formula, substitute, rearrange, and calculate. However, very few candidates were able to write clear and concise explanations.

Grade awarding

Candidates who were awarded **Achievement** commonly:

- demonstrated a basic understanding of concepts but struggled applying them to more complex tasks
- solved simpler problems (such as calculating momentum, velocity components, or spring constants) but often failed on more advanced topics, such as equilibrium, torque, and multi-step calculations
- were able to label forces in diagrams and solve one-step equations, but often struggled with deeper analysis and multi-step problem-solving.

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

- demonstrated a good understanding of fundamental physics principles and applied them to the majority of questions with reasonable accuracy
- generally responded accurately but sometimes lacked depth in explanations or made minor errors in calculations
- struggled with more complex explanations, particularly in relation to work and power.

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

- demonstrated comprehensive knowledge, excellent problem-solving skills, clear and concise explanations, and a strong ability to connect and apply physics concepts across different contexts.

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

- lacked a fundamental understanding of physics
- used formulae and equations inaccurately
- misinterpreted questions and failed to follow through with appropriate steps
- drew incomplete or incorrect diagrams
- had difficulty in performing calculations.

Achievement standard 91173: Demonstrate understanding of electricity and electromagnetism

Assessment

The examination consisted of three questions. Question One examined electric fields. Question Two examined simple circuits. Question Three examined magnetic fields.

Commentary

Candidates need to make sure they answer all parts of a question, particularly when a direction is asked for.

Candidates should ensure they correctly use the “exp” key on their calculator to enter numbers given in scientific notation, as this will avoid getting answers that are incorrect by powers of 10.

It is good practice when performing a calculation to state the formula used, show the values substituted in, and then calculate the answer. This allows the award of partial credit if a minor arithmetical error has been made.

When transferring answers from a calculator, candidates should write 1.4×10^{-3} and not 1.4E-03.

Grade awarding

Candidates who were awarded **Achievement** commonly:

- determined the direction of the force acting on a current carrying wire
- correctly connected a cell to parallel plates to generate the required electric field
- drew a parabolic path of an electron travelling in an electric field
- stated that more current went down the path with less resistance
- carried out one-step calculations
- used the electric field value as the electric potential energy
- calculated power by using energy divided by time.

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

- knew that twice the resistance meant half the current in a parallel branch
- knew to ignore the negative sign of the charge of an electron when equating E_p to E_k
- carried out two-step calculations correctly
- gave partial explanations of physics concepts, using correct physics terminology
- started by correctly stating what happened to the total resistance of a circuit when a component in a circuit was changed.

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

- set out answers in a logical manner
- explained what they were calculating at each step
- used $P = I^2 R$ or $P = \frac{V^2}{R}$ when appropriate
- set up correct physics equations and solved them using a graphics calculator
- could explain how a voltage was induced in a wire
- gave comprehensive explanations using correct physics terminology
- answered all parts of a question
- could calculate the number of electrons required to provide the required charge
- changed cm to m before calculating.

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

- stated that current was used up in series
- incorrectly applied right hand rules (or equivalent) to determine direction
- mistook V (voltage) for v (velocity)
- argued using energy when the concept was about force
- did not give directions to accompany calculations when asked for them
- thought that if a component in a circuit changed that all other quantities remained unchanged
- did not use information given in the question or values calculated from previous parts of the question
- wrote numbers and calculations everywhere, with no indication what they were calculating
- used generic phrases like current in parallel is split
- did not calculate power by using $P = \frac{\Delta E}{t}$