NZQA
New Zealand Qualifications Authority
Mana Tohu Matauranga O Aotearoa

Assessment Report

On this page

Level 2 Physics 2021

Standards 91170 91171 91173

Part A: Commentary

Candidates who persevered and attempted all the questions often found they could answer some of the later questions. Candidates who used precise physics language to support their arguments achieved higher grades. Candidates who knew what quantity each symbol in a formula stood for and its associated unit were easily able to attain the higher grades. Candidates need to be aware that the Assessment Specifications page on the NZQA website provides extra material to aid exam preparation. Candidates who reproduced answers/solutions from previous examinations were not able to display their understanding sufficiently.

Part B: Report on standards

91170: Demonstrate understanding of waves

Examinations

The examination included three questions. Candidates were required to respo
to all three. The questions covered the material from the Achievement Standard.

Light: reflection in curved mirrors, refraction through lenses, refraction, total internal reflection, critical angle at a plane boundary. Waves: reflection and refraction at a plane boundary including phase and wave parameter changes if applicable, diffraction through a slit 2-point source interference (qualitative).

Observations

Candidates were able to efficiently get to the correct answers when they clearly set out formulae and showed their working. As formulae are provided, candidates need to practise using these as part of their revision, familiarising themselves with the meaning of each symbol and the units for that measurement.

Grade awarding

Candidates who were awarded **Achievement** commonly:

- identified basic physics concepts such as diffraction and interference
- substituted given values into formulae and solved the first step in a calculation
- completed simple diagrams for rays and waves
- used Physics terms to describe the image formed by mirrors and lenses.

Candidates whose work was assessed as **Not Achieved** commonly:

- did not attempt all the questions
- did not complete their answers
- did not perform simple calculations by choosing the correct formula to use and substituting values
- did not draw correct diagrams.

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

- calculated angles, refractive indexes, magnification, distance and height correctly using the provided formulas, but did not use a negative *f* in Q3d
- explained phenomena (diffraction, interference, mirror images) accurately, by applying a definition to a given context
- drew diagrams that lacked a key point or made a slight error.

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

- provided concise statements that correctly linked physics concepts
- linked their explanations to the context of the question, i.e. how the diffraction of waves in the harbour results in interference to explain large waves in some areas
- completed multistep calculations accurately to determine the angles, refractive indexes, magnification, distance and height
- identified when the focal length was negative or positive
- used calculations to identify the nature of the image formed correctly by determining the height and distance of an image.

91171: Demonstrate understanding of mechanics

Examinations

The examination included three questions. Candidates were required to respond to all three. The questions covered requirements of the Achievement standard. Motion: constant acceleration in a straight line, free fall under gravity, projectile motion, circular motion (constant speed with one force only providing centripetal force). Force: force components, vector addition of forces, unbalanced force and acceleration, equilibrium (balanced forces and torques) centripetal force, force and extension of a spring. Momentum and Energy: momentum, change in momentum in one dimension and impulse, impulse and force, conservation of momentum in one dimension, work, power and conservation of energy, elastic potential energy.

Observations

Successful candidates were able to choose the correct formulas and solve for the asked quantity accurately, sometimes in multi-step calculations. There answers were laid out logically and neatly.

Grade awarding

Candidates who were awarded **Achievement** commonly:

- attempted most parts of most questions
- carried out simple calculations correctly

- wrote adequate explanations of some physics concepts
- demonstrated fair understanding of some basic physics ideas
- were careless with their drawing of diagrams
- confused power (*P*) with momentum (*p*)
- did not explain the different concepts of force and energy with clarity
- did not recognise the difference between ‘balanced’ and ‘equal’ in physics language
- did not read questions carefully

Candidates whose work was assessed as **Not Achieved** commonly:

- did not answer many questions
- did not demonstrate understanding of physics concepts
- did not apply physics ideas in context
- did not perform calculations.

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

- attempted most questions
- completed more complex calculations correctly, i.e. vector addition of forces, energy in a compressed spring
- applied physics ideas to explain phenomena, i.e. the path of a bike on a slippery track
- made the required links between concepts, but inconsistently
- demonstrated reasonable care in drawing diagrams
- demonstrated clear understanding of some terms but confusion with others
- wrote long explanations that lacked clarity in some parts.

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

- attempted all questions and all parts to every question
- demonstrated a comprehensive understanding of motion, force and momentum

- completed multi-step calculations correctly to calculate the horizontal distance travelled from the ramp when the bike lands and the torque forces acting on the bridge
- wrote clear, concise and logical explanations
- drew careful diagrams consistently to show how increased speed would affect the path of the projectile (rider) and path of a bike on a slippery track
- demonstrated excellent content knowledge
- interpreted questions skilfully.

91173: Demonstrate understanding of electricity and electromagnetism

Examinations

The examination included three questions. Candidates were required to respond to all three. The questions covered motors and generators, electrical circuits, and electric fields. Question One assessed candidates on DC circuits: parallel circuits with resistive component(s) in series with the source circuit diagrams, voltage, current, resistance, energy, power. Question Two was about static electricity: uniform electric field, electric field strength, force on a charge in an electric field, electric potential energy, work done on a charge moving in an electric field. Question Three covered electromagnetism: force on a current carrying conductor in a magnetic field, force on charged particles moving in a magnetic field, induced voltage generated across a straight conductor moving in a uniform magnetic field. There were resource-based questions using motors and generators as contexts. Knowledge of the functions of the parts of a motor and generator was not required.

Observations

Candidates who used precise physics terminology correctly were able to achieve in the examination. Candidates who differentiated between magnetic and electric fields and their effects were able to achieve higher grades. Some candidates did exceptionally well by demonstrating an understanding of how and why all voltage and current values in a circuit change when a component is added or removed (at constant supply voltage). At all levels an understanding that “right hand rules” are tools to help determine the direction of an effect not the cause of the effect.

Grade awarding

Candidates who were awarded **Achievement** commonly:

- identified the positive plate, given an electric field between parallel plates
- described the electric field between parallel plates as uniform
- applied the right-hand rule to find the direction of the force on a current carrying wire
- applied $V = IR$ and $P = IV$ to calculate voltage, current, resistance and power in basic circuits
- calculated the force on a current carrying wire in a magnetic field.

Candidates whose work was assessed as **Not Achieved** commonly:

- drew electric field lines between the plates instead of drawing the forces acting on the particle
- quoted generic circuit rules such as "current splits in parallel circuits" without applying them to the question
- used terms inaccurately, like power when they meant current or voltage
- did not demonstrate an understanding of electric and magnetic fields
- used learned responses from previous years to this year's questions
- did not choose the correct formula to use, as they did know what the letters in a formula stood for
- did not substitute values into formulas correctly, or did not manipulate the formulas accurately to get the correct answer
- did not draw a simple force diagram to show the forces acting on a bridge correctly.

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

- drew the forces acting on a charged particle in an electric field accurately
- knew that adding a resistor in parallel decreased the total resistance of the circuit
- did not communicate that the conductor needs to be moving perpendicular to the magnetic field in a generator

- completed calculations that involved more than one step to calculate the energy converted to heat by a resistor or the voltage induced in a coil
- linked two ideas correctly to provide an explanation for observation in electrical circuits (lamp not operating normally) or electromagnetism (direction of movement in a magnetic field).

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

- explained that adding a component into a circuit changed all the circuit parameters excluding the supply voltage
- began their argument by explaining what happened to the total resistance
- displayed comprehensive understanding of the principles by formulating their own answers that applied to the questions in this year's paper
- communicated that the movement of the conductor needs to be perpendicular to the magnetic field in a generator
- clearly labelled what each calculation was finding, to accurately determine the voltage across a lamp that was added in parallel to a circuit and the number of elementary charges in a droplet
- used correct physics terminology in all explanations.

Physics subject page

Previous years' reports

2020 (PDF, 192KB)

2019 (PDF, 108KB)

2018 (PDF, 120KB)

2017 (PDF, 46KB)

2016 (PDF, 215KB)