NZQA
New Zealand Qualifications Authority
Mana Tohu Matauranga O Aotearoa

Assessment Report

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Level 1 Physics 2021

Standards 90937 90938 90939

Part A: Commentary

Successful candidates were able to draw clear diagrams and showed logical working.

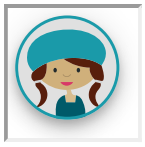
Physics uses mathematics to answers questions, and many candidates showed a lack of knowledge of using exponents, and how to use them in an equation. Candidates should ensure they know how to use the calculators efficiently and correctly, including the use of scientific notation.

Accurate use of key terms allowed candidates to achieve higher grades.

Part B: Report on standards

90937: Demonstrate understanding of aspects of electricity and magnetism

Examinations



The examination had three questions with four parts to each question. Overall, candidates had the opportunity to demonstrate their understanding over a broad range of physics concepts covered by this standard.

Observations

Candidates were able to calculate the current and voltage in series and parallel circuits, write definitions of conductors and insulators accurately and use formulas in calculations.

The right-hand grip rule was used correctly to determine the direction of current and an understanding of the magnetics field strength formula allowed the candidates to accurately use the inverse relationship between magnetic field strength and distance.

Grade awarding

Candidates who were awarded **Achievement** commonly:

- demonstrated a foundation of understanding of the core concepts
- calculated answers by selecting the correct formula and substitute numbers into the formula accurately for one-step calculations, but not two-step calculations
- made errors in the use of calculators when working problems containing scientific notation
- drew a simple circuit
- used key physical terms and phrases to describe concepts i.e. what a conductor is, how particles become charged, and the effect of magnetism
- did not apply the rules for calculating current and voltage in series and parallel circuits
- did not apply the right hand grip rule correctly to determine the direction of current in a magnetic field
- did not display understanding of which charges moved and in which direction.

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

- displayed a limited knowledge in one of the three areas
- provided inaccurate definitions, e.g. what a conductor is

- did not use key physical terms and phrases to describe concepts, i.e. talked about protons moving or positive electrons moving or difference between conductors and insulators
- did not complete a given circuit diagram and/or magnetism diagram
- did not identify the correct formula to use and/or did not substitute values into the correct formula to find an unknown
- displayed very little knowledge of the scientific concepts they were required to identify and explain
- left questions blank
- could not identify and use a formula
- demonstrated and lack of understanding of scientific notation.

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

- drew most diagrams correctly, but made careless mistakes with diagrams and/or explanations or omitted important information
- were able to identify key concepts and link scientific ideas together, i.e. linked the drop in resistance to the changes to current, but did not link rheostat resistance to total resistance
- calculated total power, but not just the heat pump's power perhaps due to misreading the question
- calculated answers by selecting the correct formula and substituted numbers into the formula accurately for one-step calculations and two-step calculations
- displayed understanding of the principle of an ioniser
- displayed understanding of the effect of charging by contact
- could explain the process of how the ioniser cleaned the air, but often did not link the dust as an insulator
- displayed knowledge of how ammeters are connected in series while voltmeters are connected in parallel
- calculated the current at a fixed distance from a magnetic field
- applied the right-hand grip rule to determine the field direction as well as identifying inverse relationship between magnetic field strength (B) and

distance (*d*).

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

- demonstrated very good understanding of the core concepts of electricity standard and applied them to the unfamiliar contexts of the questions
- read the questions carefully, made use of the information that provided and paid attention to the finer numerical details given
- completed all the calculations and were able to use scientific notation on their calculators accurately, i.e. calculated the power of the heat pump
- set out their working in a clear and logical manner which helped to avoid careless errors and made it easy to follow
- used key physical terms and phrases to describe concepts, i.e. identifying the poles, direction of the current and the nature of the magnetic force
- linked the key scientific concepts of electricity and magnetism together, i.e. explaining the movement of charge in two different contexts
- produced diagrams that were accurate and precise
- related their answers fully to the context of the question.

90938: Demonstrate understanding of aspects of wave behaviour

Examinations

The examination had three questions with four parts to each question, with many wave and ray diagrams that candidates needed to complete. Candidates with a basic knowledge of waves were able to achieve in this examination. Candidates who were able to give definitions and to correctly draw refraction, dispersion and diffraction were able to access the higher grades.

Observations

Candidates are reminded that practising drawing ray diagram should be part of their revision schedule. Using a fine pen and a ruler, the ray diagrams are drawn as straight lines with arrows pointing **from** the object **to** the eye/mirror/lens.

Grade awarding

Candidates who were awarded **Achievement** commonly:

- provided definitions of basic terms used in conjunction with waves
- stated that lights ‘bent’ towards the normal when entering water from air
- drew ray diagrams, but only drew single rays when locating images
- stated the colours of the visible spectrum
- stated correct particle vibration in transverse and longitudinal waves.

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

- did not draw ray diagrams
- displayed a lack of understanding of how diffracted waves spread out after passing a barrier
- did not define basic terms – refraction and frequency in particular
- did not know direction of energy transfer in a wave or particle vibration in transverse and longitudinal waves
- did not identify the correct angle of incidence.

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

- drew 2 diverging rays from a point when locating an image
- displayed understanding of how light behaved when entering a prism, either with dispersion or total internal reflection
- drew a diagram of diffraction of a wave past a barrier correctly
- changed units with prefixes correctly in calculations.

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

- provided answers to all questions asked in each question part
- drew neat and clear diagrams when answering questions using a fine pen and a ruler
- converted between different prefixes and units without much difficulty.

90939: Demonstrate understanding of aspects of heat

Examinations

The examination had three questions with four parts to each question. In Question One, candidates demonstrated understanding of heat transfer in the context of temperatures in a building. In Questions Two, Candidates explained the principles of convection, thermal expansion and heat energy and performed specific heat capacity calculations. Question Three required students to explain phase changes, latent heat and perform calculations in the context of a desalination plant.

Observations

Most candidates attempted all questions and were able to show their knowledge across the range of concepts covered in this standard. Candidates who were able to demonstrate understanding of thermal expansion or latent heat and accurately interpreted a heating curve were able to achieve in this examination. Higher performing candidates described convection currents using kinetic theory e.g. when explaining the movement of warm air stated that the particles became less dense or became lighter when heated. They also explained how conduction is a method of heat loss in terms of particles.

Grade awarding

Candidates who were awarded **Achievement** commonly:

- defined terms correctly, i.e. specific heat capacity
- described phenomena correctly, i.e. convection currents
- linked the concepts of heat transfer to the question's context, but lacked depth in their response, i.e. not explaining the method of heat transfer, partially interpreting the heating curve or attributing the constant temperature to overcoming forces
- used the correct formulae, but did not check for inaccuracies in calculations
- partially answered questions, i.e. identifying only one aspect of why warm air rises, calculating only part of an answer, describing the difference in specific heat capacity of dry and humid air, but not linking to the context of the question.

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

- left a number of parts in each question unanswered
- attempted calculations unsuccessfully or chose incorrect formulae for calculations
- did not link the concepts of heat transfer to the context of the questions
- did not describe thermal expansion beyond stating that thermal expansion is when an object expands
- did not describe convection.

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

- clearly explained a range of concepts within each question and ensured the answer was linked directly to the question i.e. condensation in the context of desalination
- clearly identified the specific aspect of heat being examined, e.g. thermal expansion or the method of heat transfer, in unfamiliar contexts
- carried out multiple step calculations accurately to determine the time taken to heat a room and the mass of salt water processed in a specific time.

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

- explained and discussed relevant concepts within each question, including details, and used appropriate physics terms, i.e. particles move/ vibrate, spaces between particles increase (not the particles become larger)
- made links between aspects of heat and the context of exam questions, e.g. kinetic theory linked to no increase in temperature during phase change; increase in temperature and thermal expansion
- carried out multiple step calculations accurately and used the relationships in a formula to support their discussions of aspects of heat relevant to the context in question, e.g. latent heat of condensation linked to kinetic theory.

Candidates who were awarded **Achievement** commonly:

- correctly defined terms such as latent heat, and correctly described phenomena such as convection currents
- linked the concepts of heat transfer to the question context, but answers lacked depth, such as not explaining the method of heat transfer
- partially interpreted the heating curve

- used the correct formulae, but did not convert quantities to the correct units
- were able to identify only one aspect of thermal expansion, and calculated only part of an answer
- listed reasons for heat loss without reference to the method of heat transfer.

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

- left several parts in each question unanswered
- chose incorrect formulae for calculations
- were unable to link the concepts of heat transfer to the context of the questions
- could not describe any aspects of thermal expansion
- were unable to define convection.

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

- clearly explained a range of concepts within each question and ensured the answer was linked directly to the question
- clearly identified the specific aspect of heat being examined in unfamiliar contexts
- carried out multiple step calculations accurately, but did not link the relevant concept to support correct calculation.

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

- explained and discussed relevant concepts within each question
- made links between aspects of heat and the context of exam questions
- carried out multiple step calculations accurately, and used the relationships in these formulae to support their discussions of aspects of heat relevant to the context in question, such as latent heat with reference to kinetic theory.

Standard specific comments

Physics subject page

Previous years' reports

2020 (PDF, 183KB)

2019 (PDF, 109KB)

2018 (PDF, 112KB)

2017 (PDF, 43KB)

2016 (PDF, 232KB)