

2024 NCEA Assessment Report

Subject: Earth and Space Science
Level: 3
Achievement standard(s): 91413, 91414

General commentary

In preparation for the examination, candidates are encouraged to practise unpacking and developing an understanding of the context and requirements of the exam questions. Planning answers helps candidates to provide clear answers that communicate their understanding of the ocean and atmosphere concepts studied.

Report on individual achievement standard(s)

Achievement standard 91413: Demonstrate understanding of processes in the ocean system

Assessment

The examination consisted of three required questions about ideas selected from the achievement standard, including ocean layers at different latitudes, ENSO and the effects on New Zealand, and flooding due to tides and storm surges. Each question required candidates to apply their knowledge of ocean systems to contexts provided. Candidates were encouraged to develop both written responses and labelled and annotated diagrams in their answers.

Commentary

Candidates who were able to provide even a partial answer often picked up at least one or two points for the question, while many candidates who provided no response to one or more questions were unable to be awarded any points. Use of diagrams is improving, but candidates must ensure these are linked in with the question asked, whether by annotation or adjacent written responses referring to the diagram. Candidates who achieved the highest grades were able to answer all three questions to an equally high level, and more unfamiliar contexts enabled differentiation of the highest-performing candidates. Candidates performed better when they included an annotated diagram that was linked to the question's context and their written answer.

Grade awarding

Candidates who were awarded **Achievement** commonly:

- answered two out of three questions well
- were able describe basic facts like the properties of the ocean layers, effects of ENSO, or processes of sea level rise
- submitted evidence of learning ideas, without applying them to the context or situation explicitly requested in the question

- used diagrams to highlight the basic processes related to the question
- answered all parts of the question only very briefly
- described the properties of different ocean layers
- described why the deep layer reaches the surface at the poles
- described the wind direction and a resulting effect on ENSO
- described the cause of sea level rise as ice melting and thermal expansion
- described normal tides, but not spring tides.

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

- wrote complete answers, covering all aspects of the question
- attempted all three questions
- explained the reasons or effects of key processes
- explained why the layers have different properties
- explained the cause of the deep layer reaching the surface
- explained how the winds cause water movement in ENSO and the resulting conditions in the western Pacific
- explained how melting land ice adds volume to the ocean, causing sea level rise
- explained the causes of spring tides and / or perigean tides.

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

- wrote complete and comprehensive answers, covering all aspects of the questions
- applied their understanding to explain the contexts in the question, and linked the different parts of the question together
- comprehensively explained the layers of the ocean, their properties, and how these layers form
- explained the effect of wind on the depth mixed layer, and linked how different winds at different latitudes causes a change in depth of the mixed and therefore transition layer
- comprehensively explained ENSO, with full consequences in the western Pacific, and around Aotearoa New Zealand
- comprehensively explained how land ice melting, thermal expansion, spring tides, and storms can combine to cause flooding of the Marshall Islands
- used annotated diagrams to support their written answers.

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

- wrote partial answers that did not sufficiently address the question
 - did not show sufficient understanding of the processes in the standard
 - only described one property for each layer, e.g. temperature, but not salinity or density
 - focused on the effect of ENSO in the eastern Pacific
 - described ENSO wind direction but not water movement, or vice versa
 - described sea level change as due to melting sea ice
 - described spring tides as only occurring in the spring.
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Achievement standard 91414: Demonstrate understanding of processes in the atmosphere system

Assessment

The examination consisted of three required questions about ideas selected from the achievement standard, including formation of the ITZC and its seasonal movements, human impacts on the carbon cycle, and weather systems. Each question required candidates to apply their knowledge of atmosphere systems to contexts provided. Candidates were encouraged to develop both written responses and labelled and annotated diagrams in their answers.

Commentary

Candidates' performance in this exam is improving, and there is good evidence that candidates are making good use of past papers and assessment specifications to prepare for the exam. However, some still find it challenging to apply their knowledge to the context provided in the question.

Questions with an unfamiliar context help to clearly identify the candidates working to Excellence at Level 3. Candidates performed better when they included an annotated diagram that was linked to the question's context and their written answer.

Grade awarding

Candidates who were awarded **Achievement** commonly:

- drew diagrams to aid their explanations
- described how energy differences cause convection cells
- explained evaporation and condensation processes as a result of temperature changes
- identified that warm rising air leaves low pressure and cold descending air creates high pressure
- described conditions at ITCZ, in high and low pressure systems related to cold and warm fronts
- accurately described processes that release methane and carbon dioxide
- interpreted and described patterns in the GHG table or on weather map.

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

- linked pressure gradients to movement of surface wind and atmospheric circulation
- drew detailed, labelled diagrams to aid explanations
- explained differential heating and / or the role of pressure and temperature in circulation
- used physical principles as part of explanations, e.g. variation in temp / pressure / density, rotation, Earth's tilt, and latent heat exchange
- explained processes responsible for warming atmosphere, including the role of greenhouse gases
- showed good understanding of water cycle processes
- explained the effect of clouds on insolation reaching the surface, and resulting temperature.

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

- linked multiple atmospheric processes and concepts together in discussions
- identified relationships between various factors influencing climate and weather
- analysed information provided in diagrams, maps, and tables, and applied this as part of well-reasoned arguments, e.g. linking sources, effects, lifetime, and warming potential of different greenhouse gases
- showed thorough understanding of the complexity related to Hadley cell circulation and water cycle processes to explain ITCZ cloud
- discussed in depth the relationships between radiation, temperature, pressure, albedo, atmospheric warming, and movement of air.

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

- explained the structure and layers of atmosphere, instead of circulation cells
 - misunderstood key relationships between air pressure and air movement, e.g. “sinking air causes low pressure” or “air moves from low to high”
 - repeated information provided in the question as a response
 - stated that wind is the cause of different temperatures, instead of differential heating
 - described the role of and damage to the ozone layer when discussing greenhouse gases
 - stated Earth moves further away from the Sun in winter
 - explained circulation cells instead of weather systems.
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