NZQA
New Zealand Qualifications Authority
Mana Tohu Matauranga O Aotearoa

Assessment Report

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Level 3 Earth and Space Science 2018

Standards 91413 91414

Part A: Commentary

It was very pleasing to see an increase in the number of questions attempted by candidates, with candidates in general, providing thorough answers to all questions.

The use of annotated diagrams was frequent in both standards; many diagrams were well prepared and annotated, supplementing the candidate's written responses, providing additional information or clarification of certain aspects of the written answer.

Candidates who prepared their response based on the question and resource materials produced well-written answers.

It was noted for both standards that many candidates appeared to have rote learned previous examination answers, even if they were not at all linked to the questions. Candidates need to appreciate that the examination material on the NZQA website is merely a guide, and not a source of answers for future examination questions.

Part B: Report on standards

91413: Demonstrate understanding of processes in the ocean system

Candidates who were awarded **Achievement** commonly:

- linked salinity changes and concentration to precipitation, evaporation, ice formation and melting
- linked solar heating to salinity levels at the equator and mid-latitudes
- linked polar downwelling to the freezing of seawater leading to higher salinity and density levels of water
- linked ocean downwelling to the storage of carbon and the movement of carbon dioxide
- linked onshore and offshore wind movement to upwelling and downwelling in coastal regions
- linked the correct wind strengths and surface ocean temperatures to La Niña and El Niño events
- linked changes to fishing in Peru to the respective La Niña and El Niño events
- understood the climatic conditions for both La Niña and El Niño events
- used clear annotated diagrams to show changes occurring during La Niña and El Niño events.

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

- attempted only one or two questions
- failed to annotate diagrams
- wrote irrelevant information
- incorrectly linked solar heating to the distance from the Sun
- explained upwelling and downwelling as the cause of salinity change
- linked the sinking of dense saltwater as the reason for salinity changes at the equator

- reversed or mixed up La Niña and El Niño events.

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

- explained the reasons for the patterns in ocean salinity at the equator and mid-latitudes in terms of the regions' climatic conditions, evaporation and precipitation
- explained upwelling and downwelling in coastal regions in terms of Ekman transport
- explained how carbon sequestration affects the Earth's climate
- explained how the thermocline changes, and climatic conditions for both La Niña and El Niño events
- explained how the fishing success rate was good/bad in terms of upwelling of nutrients and phytoplankton during La Niña and El Niño events.

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

- explained in detail the reasons for the changes in salinity and temperature at all three latitudes
- compared the nature of the salinity and temperature curve by explaining similarities and differences
- explained in detail the links between upwelling and downwelling caused by Ekman transport with the movement and storage of carbon, and the transfer of heat energy between the atmosphere and ocean
- explained fully the differences in climatic and ocean conditions caused by La Niña and El Niño events, and the reasons for changes to fishing success off the Peruvian coast.

Standard specific comments

Higher grades were often achieved when candidates supplemented their answers with well annotated diagrams, in particular for Ekman transport and La Niña and El Niño events.

This standard recognises some key principles in oceanography, which are interlinked with aspects of climate, ocean chemistry, biology and physical principles. Therefore, it is important that this is recognised in the candidate preparation and answers. There are clear links between ocean properties and climate, for example, salinity, ocean temperatures, air pressure, etc. It is important that candidates are familiar with these links.

In general, the reasons for upwelling and downwelling were poorly understood, with many candidates unfamiliar with equatorial upwelling. Some candidates were able to link the importance of upwelling and downwelling to carbon, carbon dioxide and heat transfer, but failed to develop full cohesive answers. Candidates were not expected to understand Ekman transport to answer this question, but it was an advantage.

91414: Demonstrate understanding of processes in the atmosphere system

Candidates who were awarded **Achievement** commonly:

- drew diagrams to show the appropriate circulation cell relevant to the desert and rainforest regions
- linked the uneven heating of Earth due to the tilt of the Earth to the formation of circulation cells
- linked evaporation at the equator to higher temperatures in the region
- linked protection of the ozone layer to UV absorption
- linked the protection from space objects to the mesosphere
- linked increased atmospheric temperatures to higher evaporation rates
- linked an increase in the water vapour content of the troposphere to increased flooding.

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

- explained the reasons for climate change in terms of the carbon cycle only
- explained the effects of climate change on the thermohaline current in the ocean
- drew atmospheric circulation cells going in the wrong direction

- explained the atmosphere's role of protection in general, rather than by specific layer
- displayed a lack of understanding of how the troposphere prevents surface temperature extremes.

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

- explained the role of solar radiation in the formation of atmospheric convection cells
- explained the reasons for the high precipitation rates in the tropics and linked this to the presence of rainforests
- explained the formation of the Hadley or Ferrel cell in terms of low and high pressure
- explained fully how the Ozone layer protects the Earth from harmful UV radiation
- explained that space objects burn up in the mesosphere in terms of friction
- explained the link between increased global temperatures to increased evaporation, condensation, and precipitation leading to increased flooding/droughts
- explained how increased evaporation leads to greater cloud formation which can lead to a positive feedback causing the global temperatures to increase.

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

- explained in detail the role of solar radiation in the formation of the Hadley cell, and how this linked to more precipitation in the tropics and dry conditions at the 30° latitude
- explained in detail how and what each layer of the atmosphere protected the Earth from
- explained the effects of increasing global temperatures on the water cycle and how this impacts weather events.

Standard specific comments

Most candidates attempted all questions and displayed a basic understanding of the atmospheric processes, with diagrams being frequently used to help explain key concepts.

Most candidates could explain how the atmosphere protects the Earth in very general terms but appeared to lack detailed understanding.

Candidates were able to clearly link increased evaporation to an increase in global temperatures, but often failed to link the subsequent changes to the water cycle, and the impact of these changes on climatic events. Few candidates referred to storm surges, (an event which is becoming far more familiar), and many did not even consider the impact of global temperatures on frozen water.

Science subject page

Previous years' reports

2016 (PDF, 212KB)

2017 (PDF, 45KB)