

**National Certificate of Educational  
Achievement**

**2013 Assessment Report**

**Earth and Space Science Level 2**

**91191 Demonstrate understanding of the causes of extreme Earth events in New Zealand**

**91192 Demonstrate understanding of stars and planetary systems**

**91193 Demonstrate understanding of physical principles related to the Earth System**

## COMMENTARY

Candidates' answers frequently lacked sufficient depth for Level 7 of *The New Zealand Curriculum*. A high level of literacy is required to succeed, and particularly to reach Merit and Excellence in each of these standards and candidates should be able to decode text, images and diagrams to aid them in writing full answers.

Candidates often failed to use resource material in their answers. Answers that did not relate information to the context of the question are unlikely to be successful in satisfying the requirements of the standards. Annotated diagrams are a good aid to support candidates written answers.

## STANDARD REPORTS

### 91191 Demonstrate understanding of the causes of extreme Earth events in New Zealand

#### ACHIEVEMENT

**Candidates who were awarded Achievement for this standard demonstrated the required skills and knowledge. They typically:**

- showed understanding of the plate tectonics underneath New Zealand
- understood that plate tectonic movement in the Taupo Volcanic Zone (TVZ) was caused by subduction of the Pacific plate under the Australian plate
- showed understanding of how earthquakes release built up energy
- showed understanding of how tsunamis form and applied this to the context of the question
- showed understanding of heating of subterranean water reservoirs by nearby magma sources
- showed understanding of the formation and composition of lava in the TVZ.

#### NOT ACHIEVED

**Candidates who were assessed as Not Achieved for this standard lacked some or all of the skills and knowledge required for the award of Achievement. They typically:**

- confused the names and directions of movement of the Pacific and Australian tectonic plates
- could not describe how an earthquake formed or released energy
- could not identify an eruption type given the lava type in the TVZ
- failed to identify geysers as being formed from heated water
- misinterpreted the resource material presented.

#### ACHIEVEMENT WITH MERIT

**In addition to the skills and knowledge required for the award of Achievement, candidates who were awarded Achievement with Merit typically:**

- explained subduction of Pacific plate under Australian plate in the TVZ by either density or plate type
- explained earthquakes in Taranaki region usually caused by transform faults
- explained tsunamis in terms of seafloor movement

- explained formation of magma as heating of subterranean water reservoirs and linked geyser formation to pressure difference
- related shape of volcanoes in the TVZ to lava composition and explosiveness.

### **ACHIEVEMENT WITH EXCELLENCE**

**In addition to the skills and knowledge required for the award of Achievement with Merit, candidates who were awarded Achievement with Excellence typically:**

- integrated the resource material into answers
- showed understanding of how the different magma compositions were formed in the TVZ
- showed understanding of the cyclic nature of geysers
- linked transform faults to the movement in the Taranaki region and explained why this fault type could cause an earthquake but not a tsunami.

### **OTHER COMMENTS**

Candidates commonly lacked knowledge of basic New Zealand geography and consequently had difficulty correctly interpreting resource material.

## **91192 Demonstrate understanding of stars and planetary systems**

### **ACHIEVEMENT**

**Candidates who were awarded Achievement for this standard demonstrated the required skills and knowledge. They typically:**

- provided descriptions of the birth of stars showing understanding of Giant Molecular Clouds and Nebulae
- explained why Mercury was rocky and Jupiter was a gas giant in terms of their position in the solar system.

### **NOT ACHIEVED**

**Candidates who were assessed as Not Achieved for this standard lacked some or all of the skills and knowledge required for the award of Achievement. They typically:**

- did not have sufficient knowledge to be able attempt all the questions
- provided rote learned answers to questions that were not asked
- provided irrelevant information.

### **ACHIEVEMENT WITH MERIT**

**In addition to the skills and knowledge required for the award of Achievement, candidates who were awarded Achievement with Merit typically:**

- explained star birth in terms of heat, mass and energy
- explained stars on the main sequence in terms of fuel use and stable mass
- explained why Mercury does not have gases whereas Jupiter is made of gases, in terms of temperature or solar winds.

## **ACHIEVEMENT WITH EXCELLENCE**

**In addition to the skills and knowledge required for the award of Achievement with Merit, candidates who were awarded Achievement with Excellence typically:**

- explained star birth in detail in terms of heat, mass and energy changes
- explained stars on the main sequence in terms of fuel use, energy changes and hydrostatic equilibrium
- explained star death in detail based on the starting mass of the Giant Molecular Cloud.
- explained why Mercury was a rocky small planet in terms of temperature, solar winds and scarcity of materials in the solar system
- explained why Jupiter is a gas giant planet in terms of temperature, solar winds and abundance of materials in the solar system
- compared characteristics of stars.

## **OTHER COMMENTS**

In general candidates showed good understanding of the life cycle and characteristics of stars but were less able to answer questions about planetary systems.

## **91193 Demonstrate understanding of physical principles related to the Earth System**

### **ACHIEVEMENT**

**Candidates who were awarded Achievement for this standard demonstrated the required skills and knowledge. They typically:**

- described heat transfer from Earth's core to crust
- described how water would be heated in the Earth's crust
- identified that volcanic ash particles in the atmosphere could reflect solar radiation and state the effect of this on the earth's atmospheric/surface temperature
- identified how the greenhouse gases from a volcanic eruption can cause an increase in the Earth's atmospheric/surface temperature
- described how the combined effects of volcanic ash and greenhouse gases change the Earth's surface/atmospheric temperature
- described why the sun's heating effect was greater over the equatorial regions of the Earth
- identified the ocean's ability to absorb large quantities of solar radiation
- identified the effects of heat transfer from the sea to the land or land to sea depending on the temperature difference
- described how a warm ocean current could transfer heat to the land.

### **NOT ACHIEVED**

**Candidates who were assessed as Not Achieved for this standard lacked some or all of the skills and knowledge required for the award of Achievement. They typically:**

- identified the Earth's core as the heat source for hot pools but gave incorrect or no detail as to heat transfer or materials involved
- stated that volcanic ash absorbs heat because of its colour therefore cools the Earth
- stated that the volcanic emissions caused acid rain

- stated that volcanic ash will not stay in the atmosphere long enough to have any effect
- misunderstood the role volcanic ash would have on solar radiation
- stated that the sun was directly over the equator all year round
- misunderstood the role the ocean plays in heating the land
- referred to how the sun heated the ocean over the equator without stating why this was important or different from the arctic regions
- showed lack of understanding of the link between the Sun's heating effect on Earth and ocean currents
- showed lack of understanding of the nature of the radiation from the Sun.

### **ACHIEVEMENT WITH MERIT**

**In addition to the skills and knowledge required for the award of Achievement, candidates who were awarded Achievement with Merit typically:**

- linked the heat transfer process from core to crust to the physical principles of conduction and convection
- explained how heat transfer takes place in the mantle and outer core in terms of the movement of molten materials relating density to temperature
- explained how water in the Earth's crust could be heated by conduction and rise in the crust due to convection currents
- explained the link between volcanic greenhouse gas emission and temperature increase of Earth's surface/atmosphere in terms of the absorption of infra-red radiation and re-emission back to the surface
- provided an explanation that linked the incoming solar radiation to how volcanic ash would cause an increase in Earth's surface/temperature by reflection of infra-red radiation from the Earth's surface
- explained how the curvature/or tilt of the Earth would lead to a variation in heating effect of the sun or incoming solar radiation
- explained how heat transfer may take place in term of convection currents from ocean to land.

### **ACHIEVEMENT WITH EXCELLENCE**

**In addition to the skills and knowledge required for the award of Achievement with Merit, candidates who were awarded Achievement with Excellence typically:**

- explained in detail the link between fault lines and the occurrence of hot pools
- explained in detail how ground water travels down through fissures to reach the heated crust in areas close to magma pools
- explained in detail the heating and cooling effects of volcanic ash and greenhouse gas emissions in the Earth's atmosphere linking this to an overall cooling effect
- explained in detail how heat transfer takes place between the ocean and atmosphere and the convection currents move the warm air from ocean onto land.