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Level 2 Earth and Space Science, 2016

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

2.00 p.m. Thursday 10 November 2016
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of the causes of extreme Earth events in New Zealand.	Demonstrate in-depth understanding of the causes of extreme Earth events in New Zealand.	Demonstrate comprehensive understanding of the causes of extreme Earth events in New Zealand.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

A regional map showing locations referred to in the questions is on Page 16 of this booklet.

You should attempt ALL the questions in this booklet.

If you need more room for any answer, use the extra space provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–16 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

TOTAL

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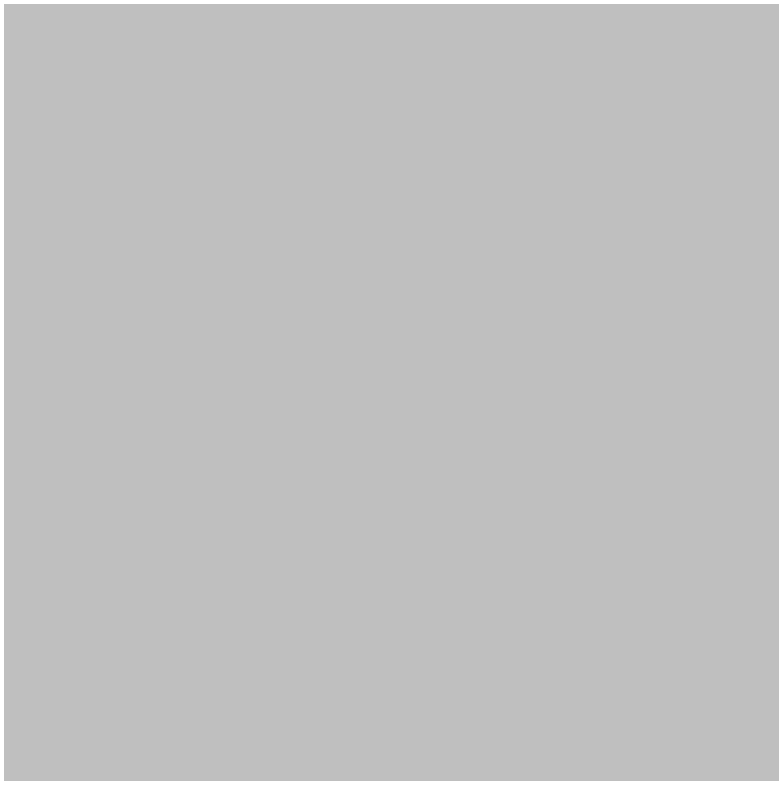
A regional map showing locations referred to in this paper is on page 16.

QUESTION ONE: OKATAINA VOLCANIC CENTRE



adapted from: www.teara.govt.nz/files/m15134enz.jpg

Aerial image looking across Lake Rotomahana towards the Tarawera Volcanic Complex.

The Okataina Volcanic Centre is in the centre of the Taupo Volcanic Zone (TVZ). It is characterised by volcanic domes and calderas and is known to have been active for the past 400 000 years. The magma in the area is mainly rhyolitic, which has a relatively low temperature (750°C); it is stiff and viscous, and has a high silica content (above 65%).

Compare and contrast the formation of volcanic domes AND calderas in the Okataina Volcanic Centre.

In your answer, you should include:

- the role of plate tectonics in forming the features of the area
- how magma type affects the formation of dome volcanoes and calderas in this area.

An annotated diagram will assist your answer.

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More space for this answer is available on the following pages.

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QUESTION TWO: FRANZ JOSEF EARTHQUAKE

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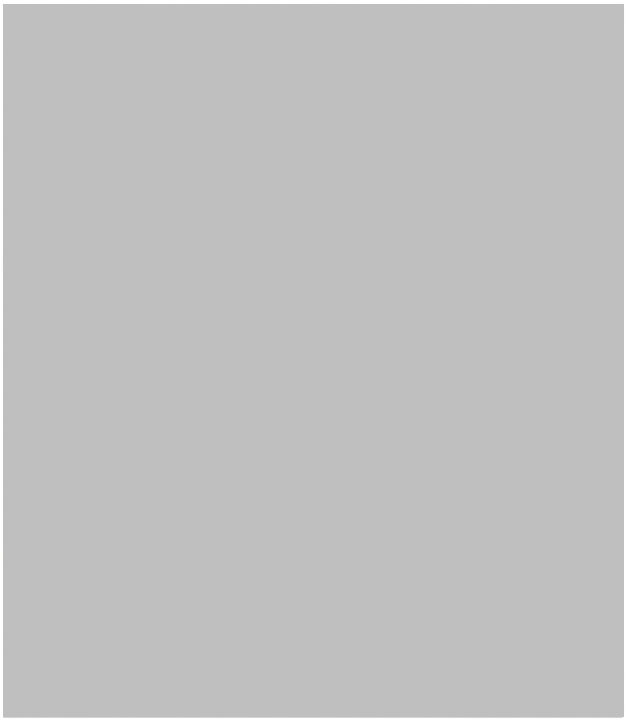
The Alpine Fault runs about 600 km up the spine of New Zealand's South Island. A section of the fault runs through the village of Franz Josef. This fault has ruptured four times in the past 900 years, each time producing an earthquake of about magnitude 8, the last time in 1717 AD. Scientists have predicted a 30% chance of a rupture occurring somewhere along the fault in the next 50 years.



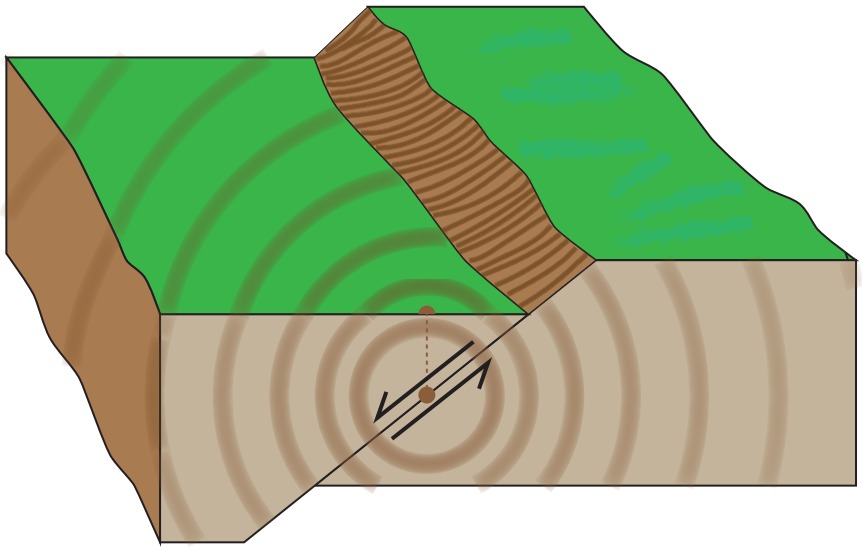
http://ncbarth.com/Fig4.10FranzJosefRAhazard.jpg

Explain the cause and likely outcomes of a magnitude 8 rupture along the Alpine Fault with an epicentre near Franz Josef.

In your answer, you should:

- explain the plate tectonic processes that would cause an earthquake in this region
- explain the likely visible effects that a large scale earthquake in this region would have on the landscape and physical structures
- refer to the photograph.

Annotations added to the diagram below will assist your answer. You may also draw and annotate additional diagrams.



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More space for this answer is available on the following pages.

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QUESTION THREE: TSUNAMI

A powerful 8.3-magnitude earthquake struck off Chile's coast on Wednesday 16 September 2015, triggering tsunami alerts and coastal evacuations along the South American coast line and throughout the Pacific Region, including New Zealand.

http://thedailyblog.co.nz/2015/09/17/tsunami-warning-for-nz-from-8-3magnitude-chile-earthquake

Explain in detail how an 8.3-magnitude earthquake off the coast of Chile could produce tsunami waves recorded 13 hours later along New Zealand's east coast AND why it is difficult to predict the likely impact these waves may have when they arrive.

In your answer, you should include:

- how tsunami waves are formed by large earthquakes
- how tsunami waves can travel long distances
- a justified explanation of why the possible impact on New Zealand is difficult to predict.

Annotations added to the diagram on the following page will assist your answer.

You may also draw and annotate additional diagrams.

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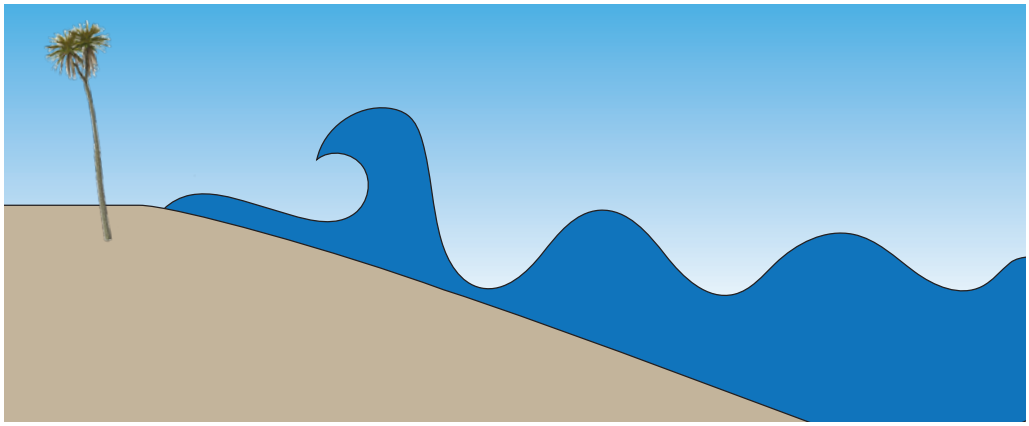

A cross-section of the coast during a tsunami.

More space for this answer is available on the following pages.

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Extra paper if required.
Write the question number(s) if applicable.

QUESTION NUMBER

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Regional Map Showing Locations Referred to in this Paper