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Level 2 Earth and Space Science, 2015

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

9.30 a.m. Tuesday 10 November 2015
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 2 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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Regional Map Showing Locations Referred to in this Paper

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The examination continues on the following page.

QUESTION ONE: LOCAL SOURCE TSUNAMI THREAT TO KAIKOURA

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Kaikoura coastline showing major known faults

http://ecan.govt.nz/advice/emergencies-and-hazard/tsunami/pages/tsunami.aspx

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Kaikoura Canyon

Adapted from: http://static2.stuff.co.nz/1302038342/862/4852862.jpg

The Kaikoura coast is known to be at risk of tsunami. There are two major sources of this risk:

- active faults on the sea floor
- submarine (undersea) landslides into the Kaikoura Canyon.

A tsunami from one of these sources would reach the Kaikoura coastline within minutes of a fault rupture or submarine landslide.

Compare and contrast these two possible sources of a tsunami that would affect the Kaikoura coast.

In your answer, you should:

- explain how a submarine landslide into the Kaikoura Canyon could result in a tsunami
- explain how a submarine earthquake may result in a tsunami
- use the diagrams above to explain, with reasons, what would be the most likely source of a tsunami on the Kaikoura coast.

Annotated diagram(s) will assist your answer.

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More space for this answer is available on the next page.

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QUESTION TWO: STRATOVOLCANOES OF THE TAUPO VOLCANIC ZONE (TVZ)

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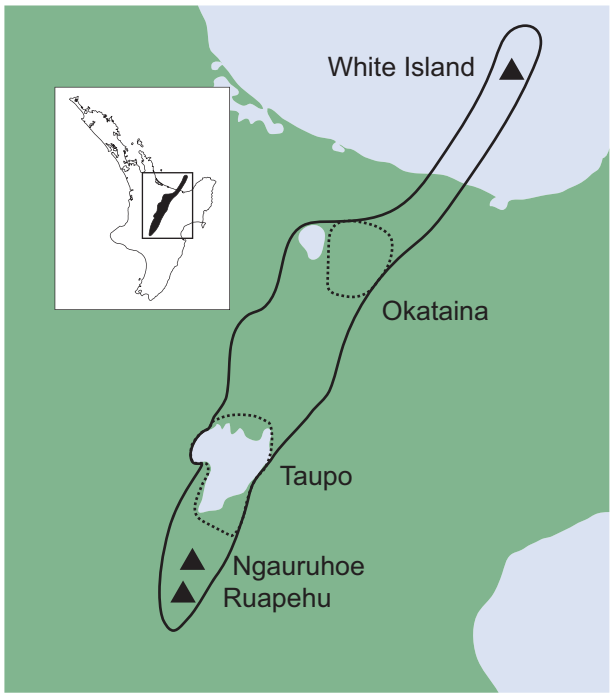

▲ Cone volcano

Caldera volcanoes

Taupo Volcanic Zone

adapted from: http://www3.stats.govt.nz/New_Zealand_Official_Yearbooks/2002/Images/fig1-3.jpg

White Island

Many volcanoes of the Taupo Volcanic Zone (TVZ), are stratovolcanoes. Examples include White Island (shown above), Ngauruhoe, and Ruapehu, which were all formed as a result of a subduction zone under the TVZ.

Explain in detail how layering contributes to the shape of one of the stratovolcanoes named above.

In your answer, you should:

- annotate the diagram opposite to show the tectonic plates and their movement in this area of the North Island
- explain, in terms of subduction, why active volcanoes occur in the TVZ
- explain why stratovolcanoes show distinct layers of eruptive material, and explain how the layers are formed.

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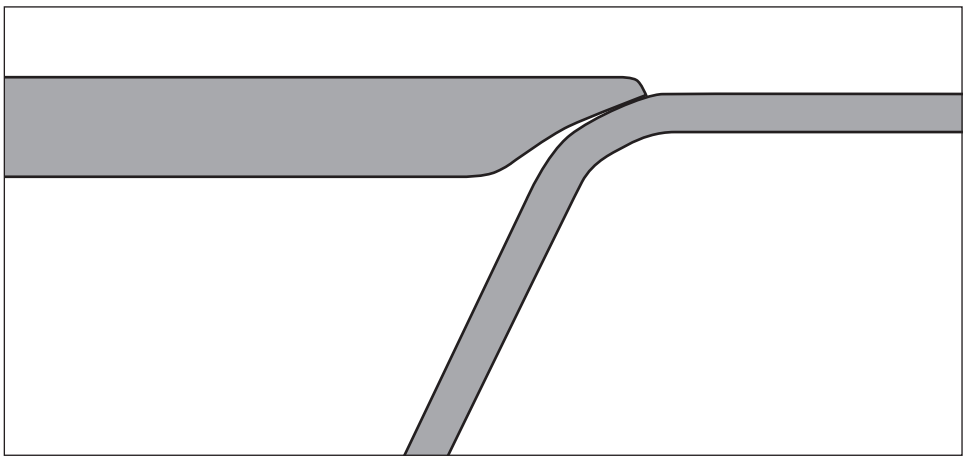

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QUESTION THREE: EKETAHUNA EARTHQUAKE

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Source: http://info.geonet.org.nz/display/quake/M+6.2,+Eketahuna,+20+January+2014

A 6.2 magnitude earthquake struck 15 km east of Eketahuna at 3.52 p.m. on Monday 20 January 2014. It was widely felt on both the North and South Islands. The focal depth was around 34 km, making this a shallow-focus earthquake. Some minor injuries from falling objects and some moderate to severe damage to buildings were reported. Eketahuna is a small town (see map on page 2) with mostly single-storied buildings.

Explain in detail why earthquakes occur in this area, AND what effects **may** be observed.

In your answer, you should:

- explain the effects that a 6.2 magnitude earthquake in this area **could** produce
- state the difference between focus and epicentre
- describe the plate tectonics that lead to transform faults underneath this region of the lower North Island
- explain how this type of tectonic plate boundary leads to earthquakes.

Annotated diagram(s) will assist your answer.

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More space for this answer is available on the next page.

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

QUESTION NUMBER

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