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SUPERVISOR'S USE ONLY

Level 2 Earth and Space Science, 2014

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

9.30 am Monday 1 December 2014

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 space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–14 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 including Locations Referred to in this Paper.

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The examination continues on the following page.

QUESTION ONE: VOLCANIC ERUPTIONS – KERMADEC ISLANDS (RAOUL)

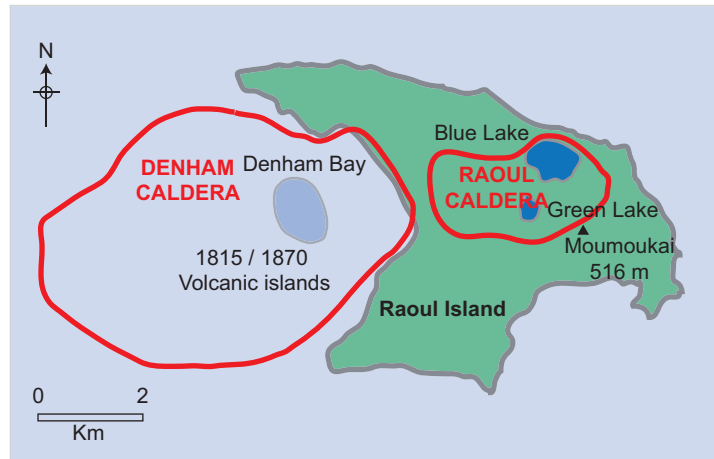
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Raoul Island volcano erupted explosively from the Green Lake area on 17 March 2006 at 8.20 am. The eruption lasted about 30 minutes.

Eruptions over the last few thousand years have been explosive with dacite magma, which is more silica rich and viscous than andesite.

Raoul Island is part of the Kermadec Islands chain, which is on the boundary between the Pacific and Australian plates.

In this area BOTH plates are waterlogged oceanic crust. The Pacific Plate is denser than the Australian Plate.



Source (adapted): <http://info.geonet.org.nz/display/volc/Kermadec+Islands>

Explain in detail how Raoul Island was formed, and why the Raoul Island volcano mostly erupts dacite magma.

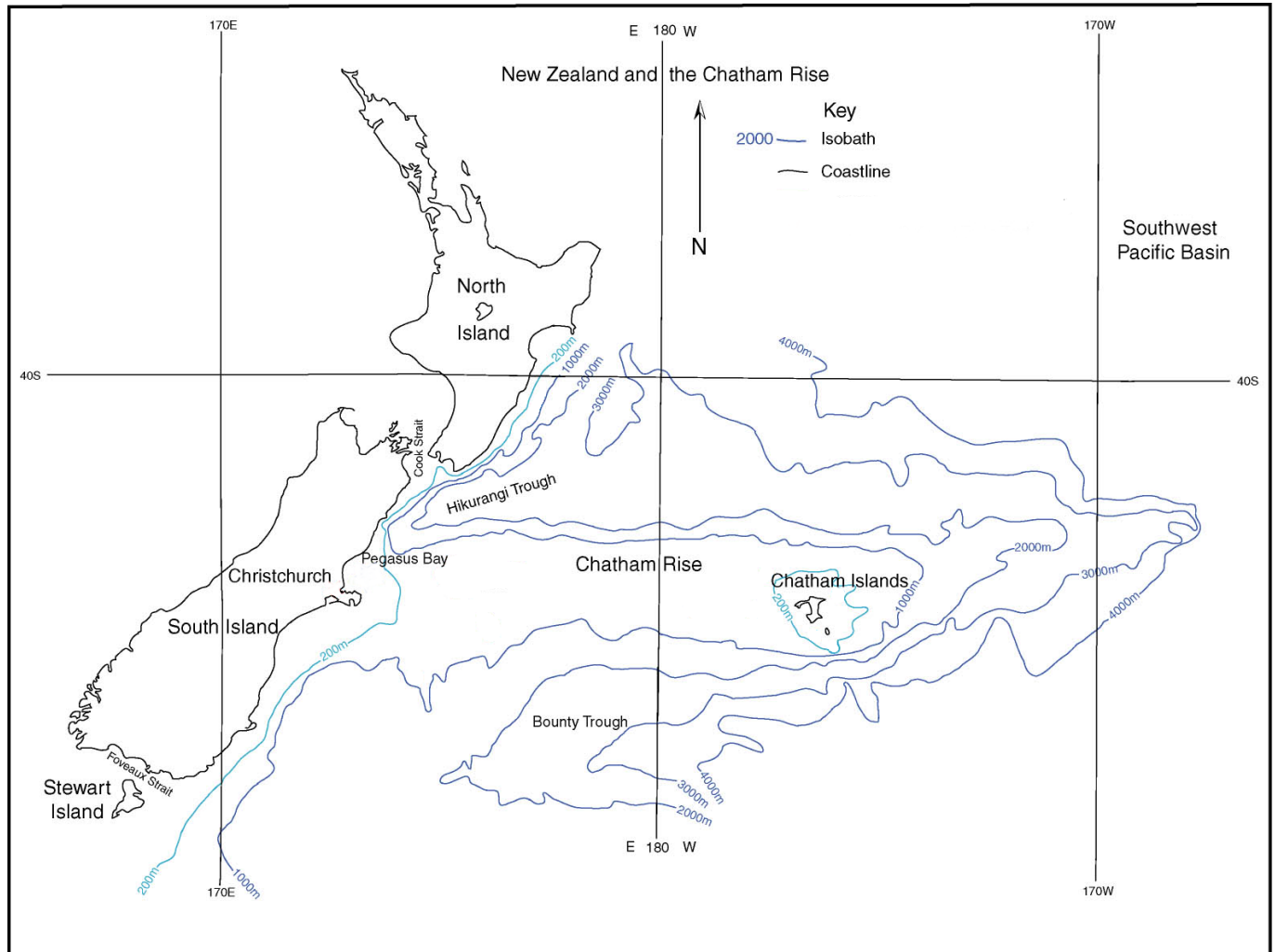
In your answer, you should:

- state which plate is subducting
- explain the tectonic plate processes occurring in this area
- explain why active volcanoes occur along the Kermadec Island chain
- explain, with reference to magma, why an eruption in this location contains dacite and is so explosive.

An annotated diagram will assist your answer.

QUESTION TWO: CHATHAM ISLANDS TSUNAMI

On 19 July 1924 starting at about 7:15 pm, a series of waves, the highest being 6 m above the high water mark, affected a number of locations on the Chatham Islands over a period of just over three hours. Those locations most affected were settlements on the northern and eastern side of Chatham Island, the largest island in the group.



Source (adapted): http://commons.wikimedia.org/wiki/File:Fig_1_Chatham_Rise_Map.jpg

It is not known how this tsunami was formed, but there are two likely causes:

- a submarine landslide
- a sea floor earthquake.

Explain how each of these could have caused the Chatham Island tsunami.

In your answer, you should:

- state what a tsunami is
- explain how a submarine landslide could result in a tsunami
- explain how a sea floor earthquake could result in a tsunami
- compare and contrast the two possible causes stated above, and give reasons to justify the most likely cause of this tsunami.

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

QUESTION THREE: SEDDON AND LAKE GRASSMERE EARTHQUAKES

*For copyright reasons,
this resource cannot be
reproduced here.*

Source: <http://info.geonet.org.nz/display/home/Cook+Strait+aftershocks+and+forecast+probabilities>

A series of earthquakes occurred during July and August 2013. The largest two were referred to as the Seddon earthquake on 21 July 2013, and the Lake Grassmere earthquake on 16 August 2013 (refer to key on map above).

The Seddon earthquake was magnitude 6.5 at a focal depth of 17 km.

The Lake Grassmere earthquake was magnitude 6.6 at a focal depth of 8 km.

These earthquakes were centred in rural, low-population areas, with the closest major urban centres being Blenheim and Wellington.

Explain in detail why earthquakes occur in this area, and what effect these earthquakes may have.

In your answer, you should:

- describe the tectonic plate boundary in this area of New Zealand
- explain how this type of tectonic plate boundary leads to earthquakes
- describe the difference between the focus and epicentre of an earthquake
- explain in detail, how the characteristics of the land affect the amount of damage observed as a result of these earthquakes.

Earth and Space Science 91191, 2014

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

QUESTION
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