91191

911910

2

SUPERVISOR'S USE ONLY

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

QUALIFY FOR THE FUTURE WORLD
KIA NOHO TAKATŪ KI TŌ ĀMUA AO!

Tick this box if there is no writing in this booklet

Level 2 Earth and Space Science 2020

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

9.30 a.m. Tuesday 17 November 2020
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.

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.

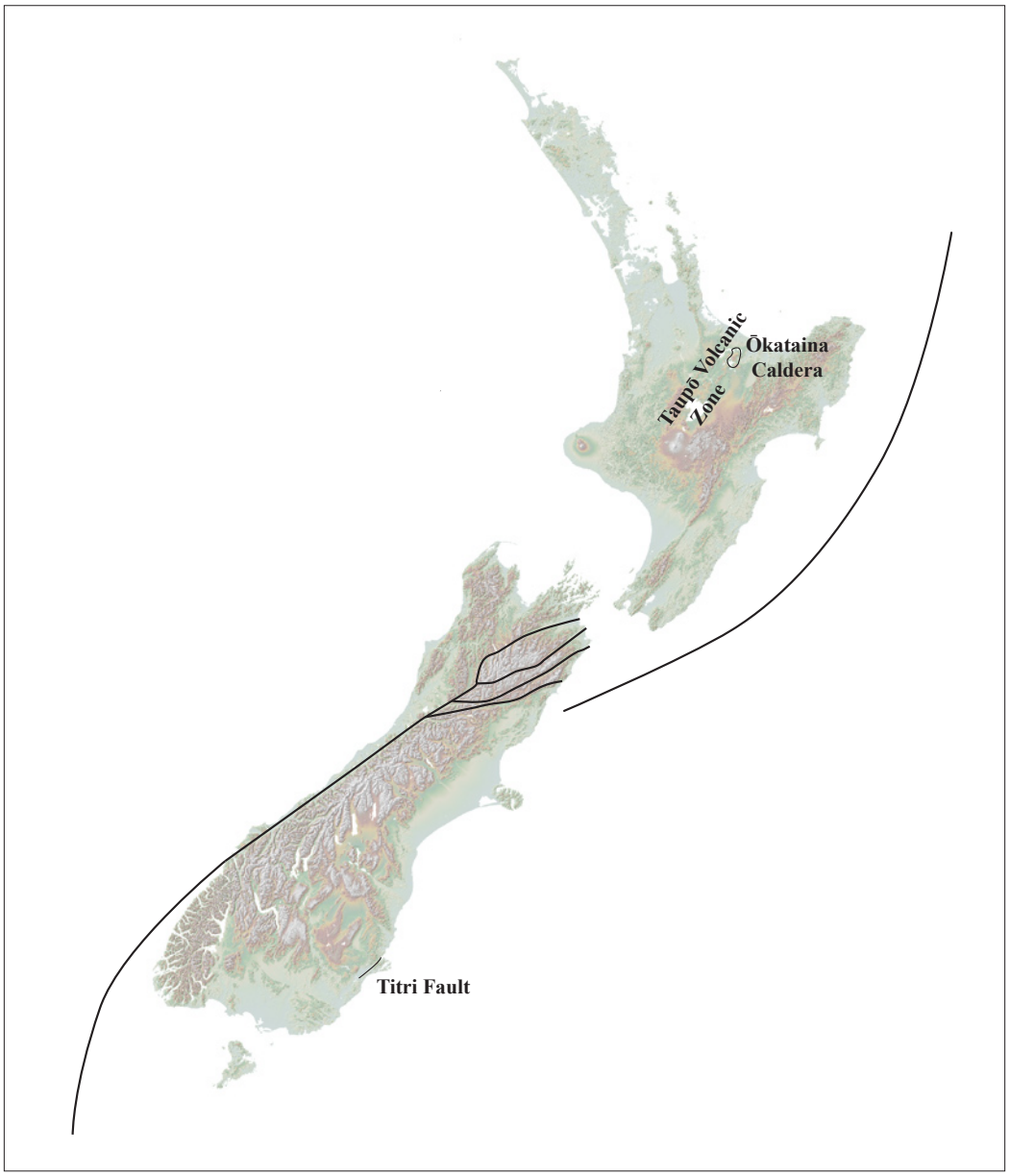
Check that this booklet has pages 2–16 in the correct order and that none of these pages is blank.

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

TOTAL

ASSESSOR'S USE ONLY

Regional map showing locations referred to in this paper

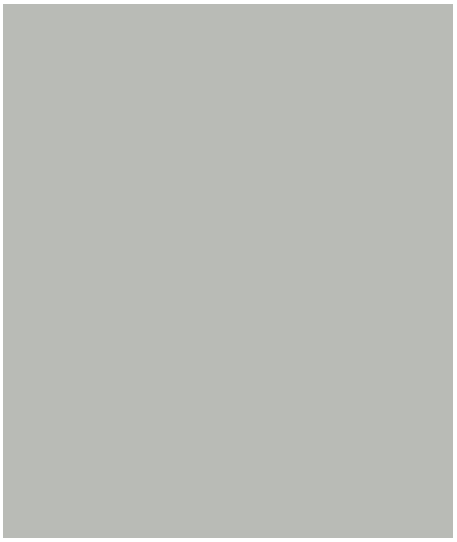


This page has been deliberately left blank.
The examination starts on the following page.

QUESTION ONE: CENTRAL TAUPŌ VOLCANIC ZONE

ASSESSOR'S USE ONLY

The central part of the Taupō Volcanic Zone (TVZ) is dominated by volcanic centres such as Ōkataina (OK). These volcanic centres are formed initially as calderas, followed by lava domes such as Haroharo.



Source: http://www.sciencedirect.com/science/article/pii/S0012825213001748

(a) The diagram below shows how the Pacific Plate subducting under the North Island forms volcanoes in the central TVZ.

Identify the following on the diagram:

- direction of the plate movement for the Pacific Plate
- the type of crust for each plate
- the two key processes that lead to the formation of rhyolitic magma.

Source: https://teara.govt.nz/en/volcanoes/page-2

(b) Explain in detail the characteristics of rhyolitic magma, and how this forms in relation to the central TVZ.

ASSESSOR'S USE ONLY

(c) Discuss how rhyolitic magma leads to calderas such as Ōkataina, and dome volcanoes such as Haroharo.

A diagram may assist your explanation.

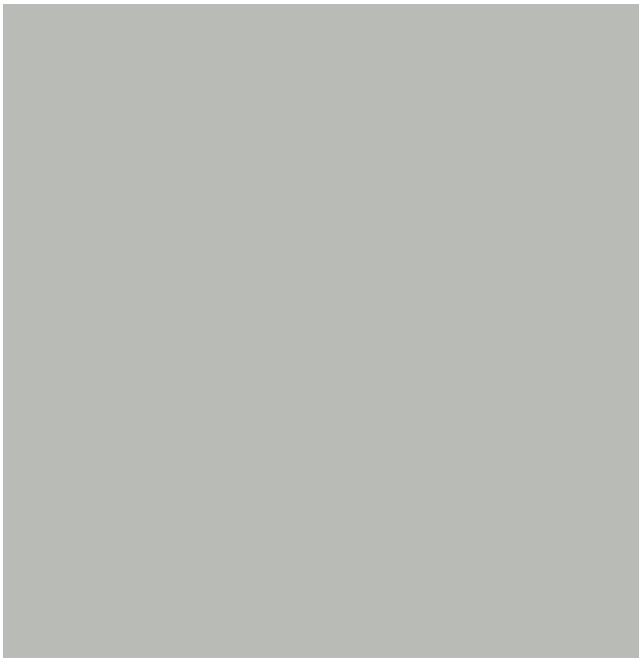
ASSESSOR'S USE ONLY

ASSESSOR'S USE ONLY

QUESTION TWO: HIKURANGI MEGATHRUST TSUNAMI RISK

ASSESSOR'S USE ONLY

Scientists researching the Hikurangi subduction zone have identified the risk of a future magnitude 8+ earthquake in the southern section of the zone. This may generate tsunami off the east coast of New Zealand.



Source: www.geonet.org.nz/news/1cpilUuSb4GESciU0yi0AM

(a) Draw a labelled diagram to show how movement of the Earth's crust could create a tsunami off the east coast of the North Island.

(b) Discuss how energy and movement of the tectonic plates could lead to a megathrust earthquake in the Hikurangi subduction zone.

A diagram may assist your explanation.

ASSESSOR'S USE ONLY

(c) Explain comprehensively how energy and crust movement during a megathrust event may result in a tsunami.

A diagram may assist your explanation.

ASSESSOR'S USE ONLY

ASSESSOR'S USE ONLY

QUESTION THREE: DUNEDIN EARTHQUAKE RISK

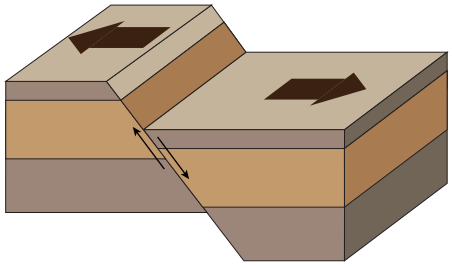
ASSESSOR'S USE ONLY

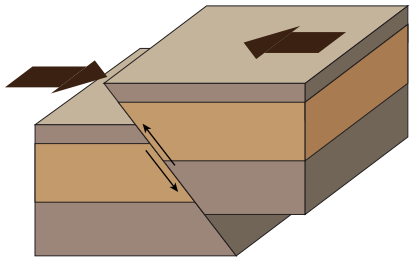
Researchers have discovered that the Titri fault near Dunedin has produced earthquakes in the past. The earthquakes are thought to have been approximately 7 in magnitude and caused uplift of 3 metres or more. This could mean there is a possible risk to Dunedin of future earthquakes along the Titri fault, despite Dunedin being quite far from a plate boundary.

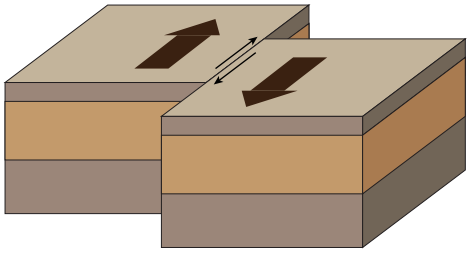
Adapted from: https://www.linz.govt.nz/sites/default/files/topography/topo-maps/nz-small-scale-maps/the-south.jpg

Source: www.stuff.co.nz/science/81763237/could-dunedin-be-hit-by-a-large-local-earthquake

(a) Label the diagrams below to identify the three main types of fault found in New Zealand.







(b) Explain in detail how movement of the Pacific Plate could lead to a large-magnitude earthquake along the Titri fault, which is over 200 km from the plate boundary.

A diagram may assist your explanation

ASSESSOR'S USE ONLY

Question Three continues on the following page.

(c) Discuss how a 3-metre uplift could be generated along the Titri fault.

Your answer should refer to the type of fault movement.

A diagram may assist your explanation

ASSESSOR'S USE ONLY

ASSESSOR'S USE ONLY

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

QUESTION NUMBER

ASSESSOR'S USE ONLY

91191