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NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

*For Supervisor's use only*

# Level 2 Science, 2009

## 90767 Describe New Zealand's geological history

Credits: Three
2.00 pm Wednesday 2 December 2009

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 answer 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 2–8 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.**

| *For Assessor's use only* | **Achievement Criteria** | | | | |
|---|---|---|---|---|---|
| **Achievement** | | **Achievement with Merit** | | **Achievement with Excellence** | |
| Describe New Zealand's geological history. | | Explain New Zealand's geological history. | | Discuss New Zealand's geological history. | |
| **Overall Level of Performance** | | | | | |

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You are advised to spend 35 minutes answering the questions in this booklet.

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## QUESTION ONE: NEW ZEALAND TODAY

(a) The South Island's Southern Alps are still being uplifted by the Kaikoura Orogeny at the rate of 10 mm per year. Despite the fact that the mountains continue to be uplifted, the altitude of these mountains remains reasonably constant.

Explain the fact that the Southern Alps are not increasing in height despite the uplift currently occurring.

(b) The last and best-understood ice age in New Zealand was the Otira Glaciation, which occurred 18 000 years ago. Much of the west coast of the South Island was covered in glaciers.

Discuss how the Otira Glaciation has contributed to the shape and features of the present day South Island of New Zealand.

## QUESTION TWO: NEW ZEALAND GEOLOGICAL EVENTS

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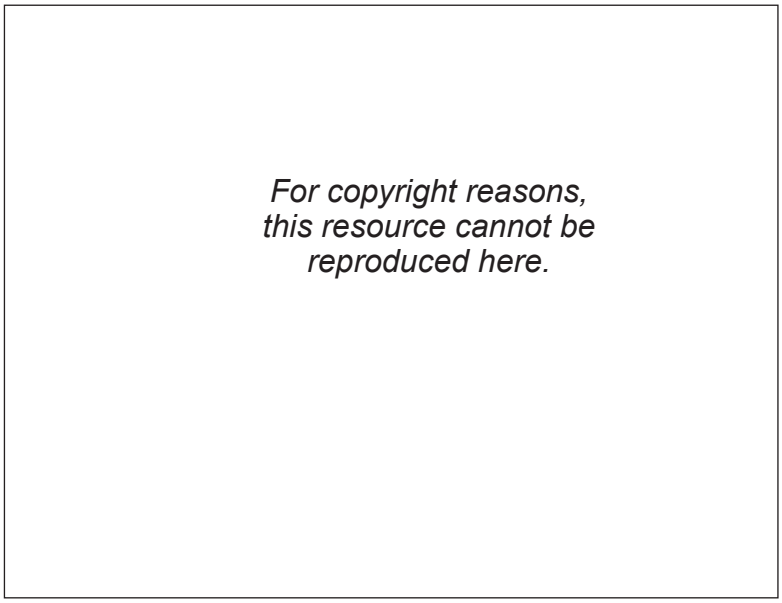
The Torlesse rocks are greywackes that are mostly sedimentary rocks making up over half of New Zealand's land mass in both the North and South Islands.

(a) The Torlesse greywackes were formed during the Rangitata Orogeny.

Describe **where** and **how** they were formed.

**Location of Torlesse Rocks across New Zealand**




Adapted from: Coates, G., *The Rise and Fall of the Southern Alps* (Christchurch: Canterbury University Press, 2002), p 31.

(b) Explain how the Torlesse greywackes were pushed above sea level 240–100 million years ago.

(c) The Torlesse greywackes also formed the basis of a New Zealand metamorphic rock type called the Haast schists, of which there are three main types:

- oligoclase
- biotite
- chlorite.

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**Very simplified section across the lower half of the South Island**

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

Adapted from: Thornton, J., *The Reed Field Guide to New Zealand Geology* (Auckland: Reed, 1985), p 99.

For **each** of the **three** types of Haast schists: oligoclase, biotite and chlorite, **compare and contrast** how the following factors affected the extent of change from sedimentary to metamorphic rock:

- heat
- pressure
- depth of burial.

## QUESTION THREE: SEA FLOOR SPREADING

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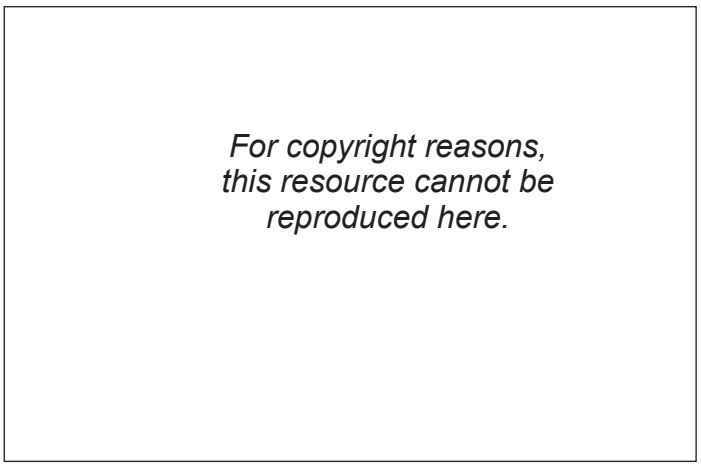
New Zealand broke away from Gondwana by the geological process of spreading of oceanic crust.




Adapted from: Aitken, J .J., *Plate Tectonics for Curious Kiwis* (Wellington: GNS, 1996), p 13.

Use the diagram above to discuss the processes and mechanics involved in **sea floor spreading.**

Use diagrams to illustrate your answer.

You should comment on:

- formation and spreading of oceanic crust
- age pattern of oceanic crust
- densities of oceanic and continental crusts
- impact on continents.

*Question Three cont.*

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**Extra paper for continuation of answers if required.**
**Clearly number the question.**

Assessor's use only

Question number