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NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

3

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Level 3 Earth and Space Science, 2013

91414 Demonstrate understanding of processes in the atmosphere system

9.30 am Tuesday 26 November 2013
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of processes in the atmosphere system.	Demonstrate in-depth understanding of processes in the atmosphere system.	Demonstrate comprehensive understanding of processes in the atmosphere system.

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 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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QUESTION ONE: REGIONAL CLIMATIC TRENDS IN THE SOUTH ISLAND OF NEW ZEALAND

The South Island West Coast and Canterbury Plains show very different regional climates.

http://www.enchantedlearning.com/oceania/newzealand/outlinemap/map.GIF

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http://www.teara.govt.nz/files/di7750enz.jpg

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Compare and contrast the climate for the West Coast and the Canterbury Plains.

Your answer should include:

- a description, and examples, of the difference between weather and climate
- an explanation of the moisture content in the air on the West Coast
- a discussion of how heat energy affects the air travelling over the Southern Alps, and the consequences of this effect.

Include a labelled diagram(s) in your answer.

There is more space for your answer to this question on the following page.

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QUESTION TWO: THE WESTERLIES

The Westerlies are wind belts that are part of the circulation of the Earth's atmosphere. The Westerlies are caused by the Ferrel convection cells.

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http://facweb.bhc.edu/academics/science/harwoodr/geog101/study/globwind.htm

Use your knowledge of the Ferrel convection cells to discuss the processes that result in the Westerlies in the Northern AND Southern Hemispheres.

Your discussion should include:

- descriptions of the Ferrel cells and the Westerlies
- a consideration of heat energy transport in the Ferrel cells
- an explanation of the role of the Coriolis effect on circulation in the atmosphere
- a comparison of the Northern Hemisphere Westerlies and Southern Hemisphere Westerlies.

Include a labelled diagram(s) in your answer.

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QUESTION THREE: COMPOSITION OF THE ATMOSPHERE

The troposphere and stratosphere are layers in the Earth's atmosphere. The diagram below shows the approximate heights of the layers above the Earth's surface.

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Adapted from http://eo.ucar.edu/basics/images/atmosphere_sm.jpg

Compare and contrast the troposphere and stratosphere with respect to:

- gas composition
- temperature AND density gradients
- the effect of aerosols including clouds
- the overall differences and similarities between the layers.

Include a labelled diagram(s) in your answer.

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

QUESTION NUMBER

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