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NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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

Scholarship 2015 Earth and Space Science

2.00 p.m. Tuesday 1 December 2015
Time allowed: Three hours
Total marks: 24

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

Pull out Resource Booklet 93104R from the centre of this booklet.

You should answer 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.

Check that this booklet has pages 2–15 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.

Question	Mark
ONE	
TWO	
THREE	
TOTAL	/24

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QUESTION ONE: RECORDS OF THE PAST IN OCEAN SEDIMENTSASSESSOR'S
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Use the information provided on page 2 of your resource booklet to answer this question.

Discuss fully how the detailed analysis of sediment cores can be used to interpret and understand past events that happened in or around New Zealand over many thousands of years.

Consider in your answer:

- major geological events, including the effects of erosion and weathering
- changes in ocean circulation and temperature
- changes in the type and distribution of marine and land-based species
- changes in climate.

You may assume, for the purposes of this question, that the sediment core record is unbroken.

Well labelled diagrams may assist your answer.

QUESTION TWO: CHANGES IN ATMOSPHERIC CIRCULATION IN THE SOUTHERN HEMISPHERE

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Use the information provided on pages 4 and 5 of your resource booklet to answer this question.

Discuss in detail the consequences of the effects that both the ozone hole over Antarctica and the increase in greenhouse gases (GHG) have had on the Southern Hemisphere's atmospheric circulation and the position of climate belts.

Consider in your answer:

- how the ozone hole has caused cooling of the stratosphere and the southwards shift of wind and climate belts
- how the ozone hole and increasing concentrations of greenhouse gases indirectly work together to enhance the depletion of ozone in the stratosphere
- the implications of the eventual recovery of the ozone layer on the Southern Hemisphere's atmospheric circulation and the position of climate belts.

Well labelled diagrams may assist your answer.

QUESTION THREE: HABITABLE ZONES AROUND RED DWARF STARSASSESSOR'S
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Use the information provided on pages 6 and 7 of your resource booklet to answer this question.

The search is on for rocky planets around red dwarf stars, that may have life on them. One of the key requirements is a liquid medium, such as water. Therefore astronomers have been looking for planets in an area the right distance away from a star for liquid water to be present – the habitable zone.

There is gathering evidence that liquid methane could also be a suitable medium for life. If this is shown to be true, there may be a second habitable zone around some stars.

Discuss in detail the possibility of TWO habitable zones around red dwarf stars as they form and age.

Consider in your answer:

- the relative positions of two habitable zones around red dwarf stars
- the most likely zone for life to evolve
- the implications for evolving life in both zones as a red dwarf star forms and ages.

Well labelled diagrams may assist your answer.

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

ASSESSOR'S
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QUESTION
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