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91414M

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Tuhia he (☒) ki te pouaka mēnā kāore koe i tuhi kōrero ki tēnei puka

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NZQA

Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Te Pūtaiao ā-Nuku, ā-Tuarangi, Kaupae 3, 2023

91414M Te whakaatu māramatanga ki ngā tukanga i te pūnaha kōhauhau

Ngā whiwhinga: E whā

Paetae	Kaiaka	Kairangi
Te whakaatu māramatanga ki ngā tukanga i te pūnaha kōhauhau.	Te whakaatu māramatanga ki ngā tukanga i te pūnaha kōhauhau, kia hōhonu.	Te whakaatu māramatanga ki ngā tukanga i te pūnaha kōhauhau, kia tōtōpū.

Tirohia kia kitea ai e rite ana te Tau Ākonga ā-Motu (NSN) kei runga i tō puka whakauru ki te tau kei runga i tēnei whārangi.

Me whakamātau koe i ngā tūmahi KATOA kei roto i tēnei pukapuka.

Mēnā ka hiahia wāhi atu anō koe mō ō tuhinga, whakamahia ngā whārangi wātea kei muri o tēnei pukapuka.

Tirohia kia kitea ai e tika ana te raupapatanga o ngā whārangi 2–23 kei roto i tēnei pukapuka, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

Kaua e tuhi ki tētahi wāhi e kitea ai te kauruku whakahāngai (DO NOT WRITE IN THIS DO NOT WRITE). Ka poroa taua wāhanga ka mākahia ana te pukapuka.

HOATU TĒNEI PUKAPUKA KI TE KAIWHAKAHAERE HEI TE MUTUNGA O TE WHAKAMĀTAUTAU.

TE TŪMAHI TUATAHI: TE RERE IKEIKE

E pai ake ana ki ngā kaiurungi o ngā torohaki e rere tawhiti ana te rere i te kōhaupapa o raro. I te kōhaupapa, kāore e pērā rawa ana te kino o te hūkerikeri o te kōhauhau e puta ana i te hau e piki haere ana. Ka whai hua ake hoki te whakapaunga o te kora i te waka rererangi, nā te mea e angiangi ake ana te hau. Heoi, me rawaka te hāora i te pūkaha torohaki e rere ai. I ētahi wā, ka whai ngā kaiurungi i ngā ia hau i te kōhauhuri o runga.

Te Hoahoa 1: Ngā wāhi o ngā ia hau **Te Hoahoa 2: Te kōhaupapa me te kōhauhuri**

Matapakina he take e pai ake ana ki ngā kaiurungi te rere i te kōhaupapa, tēnā i te kōhauhuri.

I tō tuhinga, me whakamārama koe i:

- ngā rerekētanga o te kiato, o te pēhanga, o te mahana, o te hanganga hoki o te kōhauhuri me te kōhaupapa
- ngā āhuatanga o te kōhauhau i ngā pae e rua, me te āhua o te pānga ka puta pea ki ngā rerenga waka
- te āhua o te hāpainga rānei, o te whakararutanga rānei a ngā ia hau i ngā rerenga.

Ka whai hua pea ki tō tuhinga tētahi hoahoa whai kupu tāpiri.

QUESTION ONE: FLYING HIGH

Pilots of jet aircraft that fly long distances prefer to fly in the lower stratosphere. In the stratosphere, atmospheric conditions have less turbulence which is caused by the vertical movement of air. Aircraft also have better fuel efficiency, as the air is thinner. However, jet engines need sufficient oxygen to work. Sometimes pilots make use of jet streams in the upper troposphere.

Figure 1: Jet stream locations

Source: www.weather.gov/jetstream/jet

Figure 2: The stratosphere and troposphere

Source: https://geoengineering.global/stratospheric-aerosol-injection/

Discuss why pilots prefer to fly in the stratosphere, instead of the troposphere.

In your answer, you should explain:

- differences in density, pressure, temperature, and composition of the troposphere and stratosphere
- atmospheric conditions in both layers, and how this may impact on flights
- how jet streams may help or hinder flights.

An annotated diagram may assist your answer.

He wāhi anō mō tō tuhinga mō tēnei tūmahi kei ngā whārangi e whai ake nei.

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

TE TŪMAHI TUARUA: TE REHUTAI

Kei te kōhauhuri te kukūtanga o te rehutai nui katoa, e tata ana ki te 50 °S. Ka kawea mai te rehutai ki Aotearoa e ngā hau kaha, e ngā hau karioi hoki ka pupuhi mai i te uru i te mata o Papatūānuku. Mā reira e kīia ai ko Te Tai Poutini i Te Waipounamu te rohe mākū katoa o Aotearoa.

Te Hoahoa 3: Te huanga mai o te rehutai

He mea whakahāngai i: www.mdpi.com/2072-4292/13/4/614

Te Hoahoa 4: Te kukūtanga o te rehutai i te mata o Papatūānuku

Te mātāpuna: https://pdfs.semanticscholar.org/8eb9/33a0e3594e9c6f13ad6b17d020acea94b138.pdf?_ga=2.189352232.2063430432.1658545364-1415782361.1658545364

Whakamāramatia ngā tukanga e hua ai ngā kapua me te kaha o te ua i Te Tai Poutini o Te Waipounamu.

I tō tuhinga, me whakaaroaro koe ki:

- te huanga mai o te pūtau Ferrel me ngā hau i te mata o Papatūānuku kei te takiwā o te ahopae 50 °S
- te putanga mai o te rehutai me tana whai wāhi atu ki te huanga o ngā kapua.

Ka whai hua pea ki tō tuhinga tētahi hoahoa whai kupu tāpiri.

QUESTION TWO: AEROSOLS

The highest concentrations of sea spray aerosols occur in the lower troposphere near 50 °S. The spray is transported towards New Zealand by strong prevailing westerly surface winds. This contributes to the west coast of the South Island being the wettest area in New Zealand.

Figure 3: Production of sea spray aerosols

Adapted from: www.mdpi.com/2072-4292/13/4/614

Figure 4: Sea-spray concentration at Earth's surface

Source: https://pdfs.semanticscholar.org/8eb9/33a0e3594e9c6f13ad6b17d020acea94b138.pdf?_ga=2.189352232.2063430432.1658545364-1415782361.1658545364

Explain the processes that lead to cloud formation and high rainfall on the west coast of the South Island.

In your answer, you should consider:

- the formation of the Ferrel cell and surface winds around 50 °S latitude
- the production of salt spray aerosols and the role they play in cloud formation.

An annotated diagram may assist your answer.

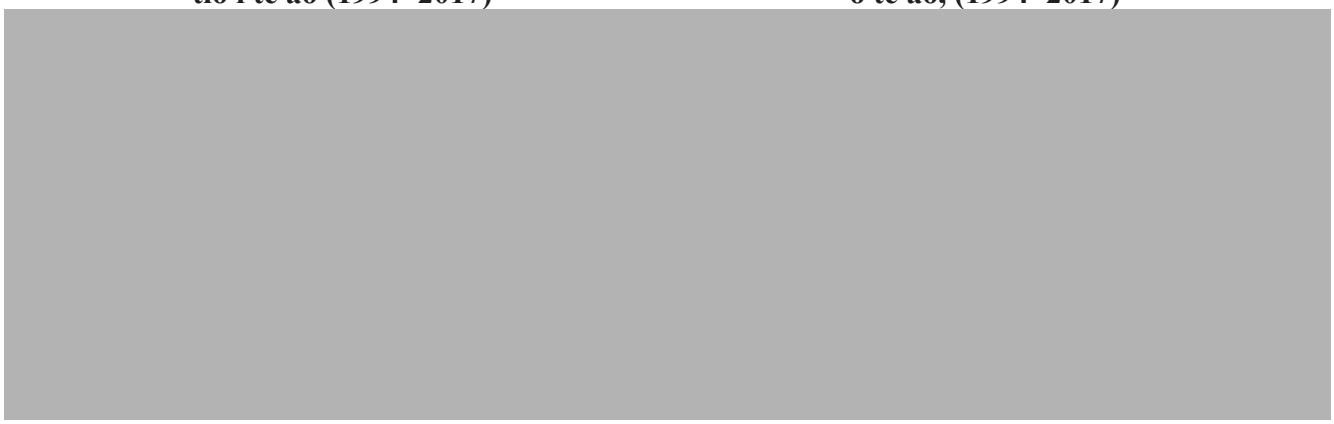
He wāhi anō mō tō tuhinga mō tēnei tūmahi kei ngā whārangi e whai ake nei.

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

TE TŪMAHI TUATORU: NGĀ KATONGA TAI O TE ĀHUARANGI O TE AO

E matapaetia ana kua mimiti te 28 tiriona tana o te tio i te mata o Papatūānuku i waenga i te tau 1994 me te tau 2017. I taua wā tonu rā, i 0.7 °C te pikinga o te paemahana toharite o te ao. Kīia ai e ngā kaimātai āhuarangi he "katonga tai" pea tēnei, arā, he panonitanga iti i te pūnaha āhuarangi e hua ai pea ētahi panonitanga nui noa ake e kore e hokia. Kīia ai hoki tēnei he hurihanga whākaha *(positive feedback loop)*.

Te Hoahoa 5: Te panonitanga i te papatipu tio i te ao (1994–2017)



He mea whakahāngai i: https://www.researchgate.net/figure/Global-ice-mass-change-between-1994-and-2017-partitioned-into-the-different-floating_fig4_348753744)

Te Hoahoa 6: Te paemahana toharite o te mata o te ao, (1994–2017)

He mea whakahāngai i: https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/global/time-series/globe/land_ocean/12/1/1994-2017

Matapakina ngā pūtaketanga me ngā pānga o te hekenga o te kōpaka ki te kōhauhau me te āhuarangi o te ao.

I tō tuhinga, me whakamārama koe i:

- te kati mahana, tae atu ki ngā panonitanga nā runga i tā te tangata mahi
- te āhua o tā te tio i te mata o te whenua whakataki i te mahana o te kōhauhau
- te āhua o te huanga pea o te tere ake o te hurihuri o te āhuarangi nā te panonitanga i te tio i te mata o te whenua.

Ehara i te mea me kōrero te panonitanga o te pae moana, ngā pūnaha moana rānei.

Ka whai hua pea ki tō tuhinga tētahi hoahoa whai kupu tāpiri.

QUESTION THREE: GLOBAL CLIMATE TIPPING POINTS

An estimated 28 trillion tons of ice disappeared from the Earth's surface between 1994 and 2017. Over the same period, the average global temperature increased by 0.7 °C. Climate scientists consider this to be a potential "tipping point", which is a small change in the climate system that could lead to much greater irreversible changes. This is also referred to as a positive feedback loop.

Figure 5: Global change in ice mass (1994–2017)

Adapted from: https://www.researchgate.net/figure/Global-ice-mass-change-between-1994-and-2017-partitioned-into-the-different-floating_fig4_348753744)

Figure 6: Average global surface temperature, (1994–2017)

Adapted from: https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/global/time-series/globe/land_ocean/12/1/1994-2017

Discuss the causes and effects of a decline in polar ice on the atmosphere and global climate.

In your answer, you should explain:

- the greenhouse effect, including changes due to human activity
- how surface ice regulates atmospheric temperature
- how change in surface ice may lead to faster climate change.

You do not need to discuss sea level change or ocean processes.

An annotated diagram may assist your answer.

He wāhi anō mō tō tuhinga mō tēnei tūmahi kei ngā whārangi e whai ake nei.

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

He whārangi anō ki te hiahiatia.
Tuhia te tau tūmahi mēnā e hāngai ana.

TE TAU TŪMAHI

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

QUESTION NUMBER

He whārangi anō ki te hiahiatia.
Tuhia te tau tūmahi mēnā e hāngai ana.

TE TAU TŪMAHI

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

QUESTION NUMBER

English translation of the wording on the front cover

Level 3 Earth & Space Science 2023

91414M Demonstrate understanding of processes in the atmosphere system

Credits: Four

91414M

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 room for any answer, use the extra space provided at the back of this booklet.

Check that this booklet has pages 2–23 in the correct order and that none of these pages is blank.

Do not write in any cross-hatched area (DO NOT WRITE IN THIS AREA DO NOT WRITE). This area will be cut off when the booklet is marked.

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