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NZQA
NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

3

SUPERVISOR'S USE ONLY

Level 3 Earth and Space Science, 2014

91414 Demonstrate understanding of processes in the atmosphere system

2.00 pm Tuesday 2 December 2014
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 2–12 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: CONVECTION CELLS

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The Polar Cells are convection cells that are located in the polar regions.

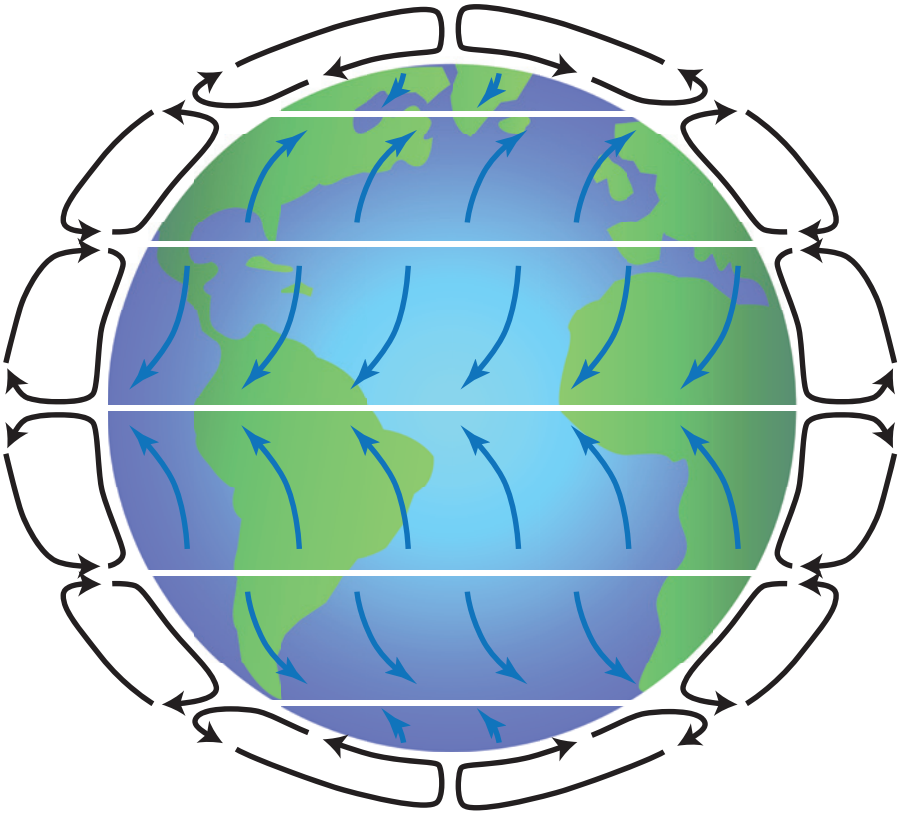
The Hadley Cells are convection cells that are located near the Equator.

Compare the processes that form the Polar and Hadley Cells.

Your answer should include:

- a description of a convection cell
- an explanation of the features of the Polar Cells AND the Hadley Cells
- an explanation of the role of solar radiation in the Polar Cells and the Hadley Cells
- a discussion of the reasons for the differences and similarities between the Polar and the Hadley Cells.

Fully annotate the diagram below to support your answer.



Source (adapted): http://sweetclipart.com/multisite/sweetclipart/files/shiny_glossy_earth_logo.png

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QUESTION TWO: THE WATER CYCLE

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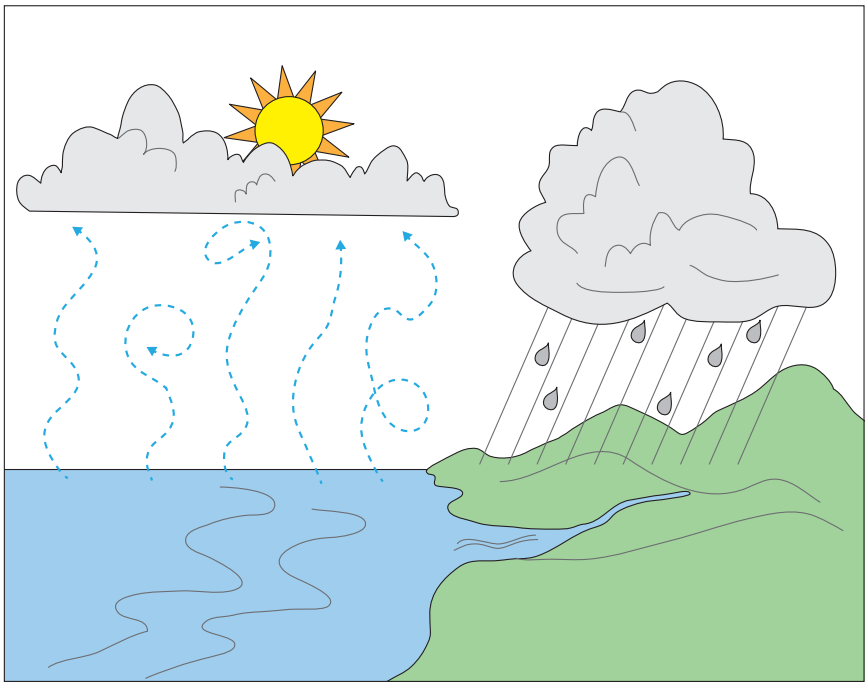

Source (adapted): http://education.jlab.org/reading/img/water_cycle_01.gif

(a) A very simple diagram of the water cycle is shown above.

Use this to help you construct a complex fully labelled diagram showing how water changes state in each of the processes involved, and where energy is lost or gained.

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(b) Discuss the cycling of water in the atmosphere and the impacts on weather/climate at the Equator and the Poles.

Your answer should include:

- the changes of state of water that occur in the atmospheric water cycle during evaporation, condensation, and precipitation
- an explanation of the energy changes and the subsequent impact on air temperatures that occur during evaporation, condensation, and precipitation
- a comparison of the water cycle at the Equator and at the Poles, and the effect on the climate.

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

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The examination continues on the following page.

QUESTION THREE: VOLCANIC AEROSOLS

Aerosols from volcanic eruptions can reach different layers of the Earth's atmosphere. These aerosols in the atmosphere can affect regional and / or global climates.

Aerosols from large explosive eruptions, such as Taupo in 181 AD, are able to reach the stratosphere. Aerosols from much smaller eruptions, such as Mt Ruapehu in 1995, will reach only the troposphere.

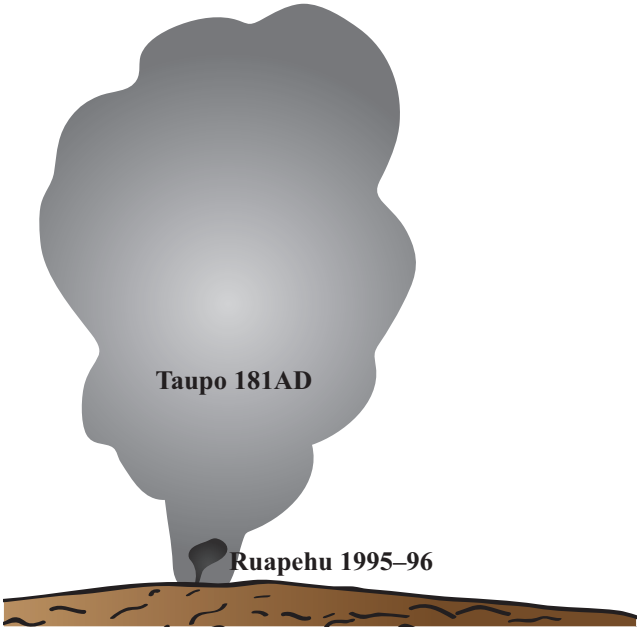

Diagram showing the different eruption sizes for Taupo and Ruapehu.

Source (adapted): www.standeyo.com/NEWS/06_Earth_Changes/06_Earth_Change_pics/061001.Taupo.eruption_sizes.jpg

Compare and contrast the transport and effect on climate of volcanic aerosols from the two different eruptions labelled above.

Your answer should include:

- identification of the troposphere and stratosphere on the diagram opposite
- a description of the composition of volcanic aerosols
- an explanation of how aerosols from volcanic eruptions are transported between and within the troposphere and stratosphere.
- a discussion of how volcanic aerosols in the troposphere and stratosphere could affect regional AND global climate.

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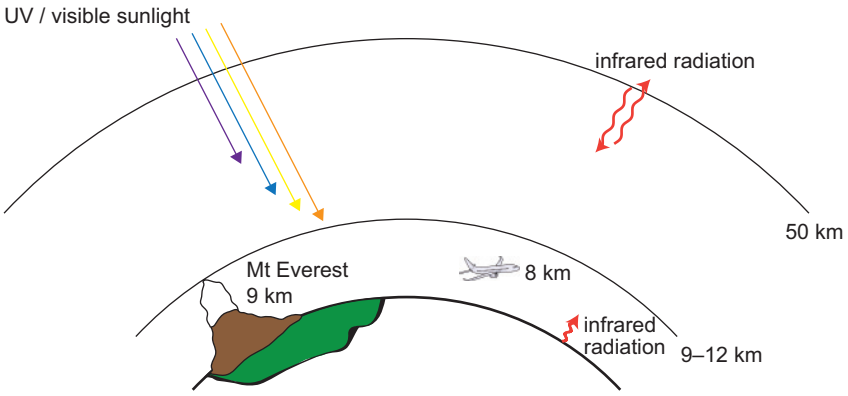
Layers of the Atmosphere



Source (adapted): www.ozonelayer.noaa.gov/science/regions.jpeg

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

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

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