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Level 3 Earth and Space Science, 2017

91414 Demonstrate understanding of processes in the atmosphere system

2.00 p.m. Monday 27 November 2017
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 room for any answer, use the extra space 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

The Northern and Southern hemispheres are divided up into three types of convection cells – the Hadley, Ferrel, and Polar.

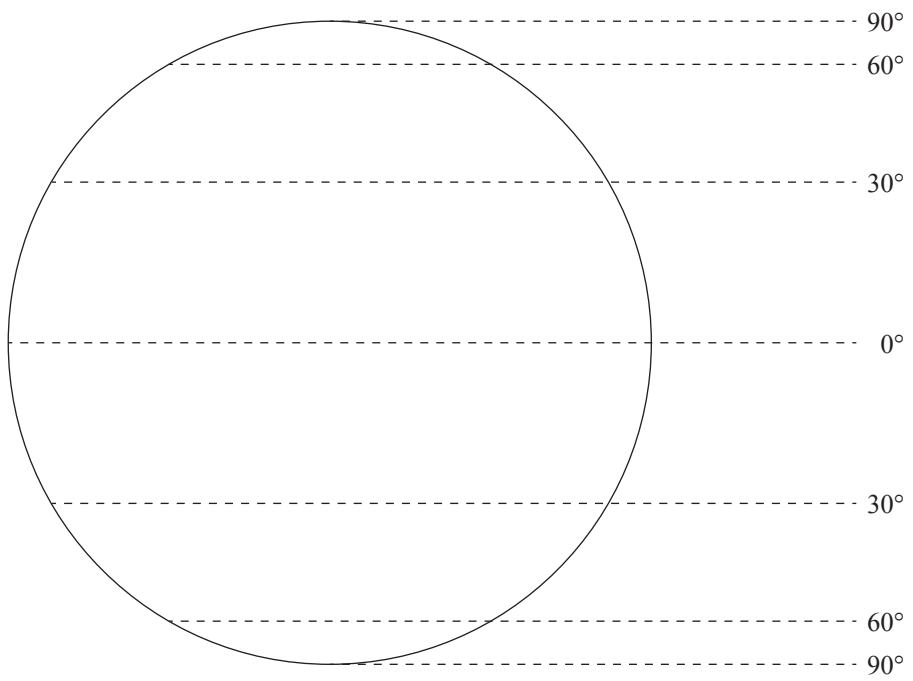
The Ferrel cells differ from the Hadley and Polar cells.

Explain how the three convection cells are formed AND why the Ferrel cells differ from the Hadley and Polar cells.

In your answer you should consider:

- what a convection cell is
- the role of solar radiation and the Earth's rotation in relation to the formation of the three cell types
- what drives each of the cells.

Fully annotate the diagram below to support your answer.



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

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QUESTION TWO: VOLCANIC AEROSOLS

On 27 September 2016, the Rinjani volcano on the island of Lombok in Indonesia erupted, generating a dense plume of ash, gases, and rock fragments.

The 2016 eruption caused a short-term regional climate impact; however past eruptions from Rinjani have been linked to longer-term global climate impacts. These impacts are largely due to aerosols.

Explain the effect of different volcanic aerosols on BOTH regional and global climates.

In your answer you should consider:

- what an aerosol is
- why different types of volcanic aerosol are found in different layers of the atmosphere
- the relationship between the size of eruption and climatic impact produced.

You may include annotated diagrams to support your answer.

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

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QUESTION THREE: ATMOSPHERIC FEEDBACKS

In 2016, global temperatures were the hottest on record since records began in the 1880s. NASA scientists said it was showing a continuing decades-long trend in global temperature rise, being driven by rising concentrations of greenhouse gases in the atmosphere.

Global Mean Surface Temperature (January – June)

https://svs.gsfc.nasa.gov/vis/a010000/a012300/a012305/gistemp_Jan-Jul_preI.png

Feedbacks in the Earth's climate system are interactions between climate variables and elements that can control the greenhouse effect, for example: clouds / water vapour, permafrost, desertification, sea ice, oceans.

Explain how feedbacks can affect global warming.

In your answer you should:

- explain what the greenhouse effect is
- explain the effect of the feedbacks listed above on global warming.

You may include annotated diagrams to support your answer.

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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.

QUESTION NUMBER

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