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NZQA

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# Level 3 Earth and Space Science, 2016

## 91413 Demonstrate understanding of processes in the ocean system

2.00 p.m. Wednesday 30 November 2016
Credits: Four

| Achievement | Achievement with Merit | Achievement with Excellence |
|---|---|---|
| Demonstrate understanding of processes in the ocean system. | Demonstrate in-depth understanding of processes in the ocean system. | Demonstrate comprehensive understanding of processes in the ocean 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 2–16 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: OCEAN LAYERS

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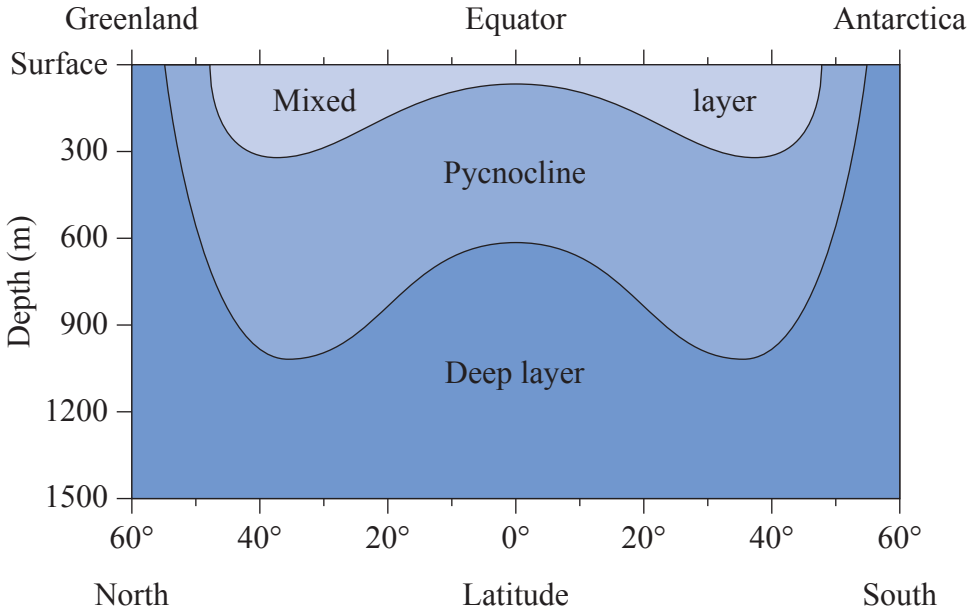
Ocean waters can be separated into three layers: the mixed or surface layer, the pycnocline layer, and the deep ocean layer. The relative depths of these layers can vary with the seasons and latitude.




Adapted from: http://oceanmotion.org/html/background/ocean-vertical-structure.htm

Explain the properties of each layer, and how these layers can vary with seasons and latitude.

In your answer you should refer to depth, density, temperature, and salinity.

You may include annotated diagrams to help 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: THE GULF STREAM

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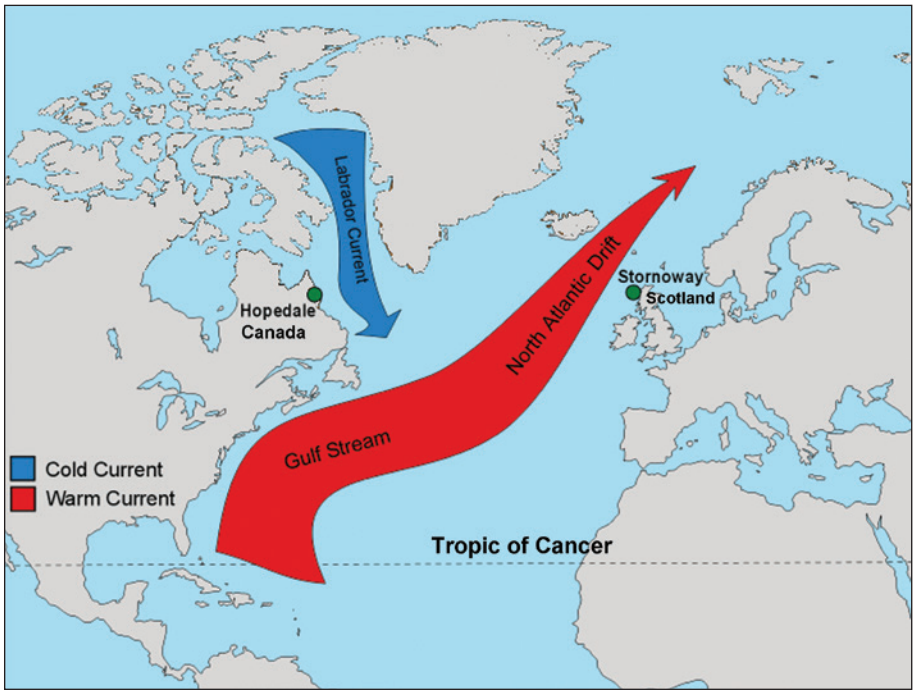
The Gulf Stream is a huge surface ocean current travelling north from the Equator, transporting 100 million cubic metres of water per second. This current plays a very important role in transferring energy to the water and atmosphere of northern Europe, giving a much warmer climate than if the Gulf Stream was absent or slower. In the North Atlantic this water then sinks deep into the ocean as part of the global circulation.




Adapted from www.earthlyissues.com/gulfstream.htm

Explain how ocean processes cause the water of the Gulf Stream to move north to heat Europe and then sink before moving south as part of the global thermohaline circulation.

In your answer you should:

- explain the factors that cause the Gulf Stream to move north
- explain factors that cause the water to sink near the Arctic Circle
- explain the possible effect on the European climate of a slower or absent Gulf Stream.

You may include annotated diagrams to help 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 THREE: THE SOUTH PACIFIC GYRE

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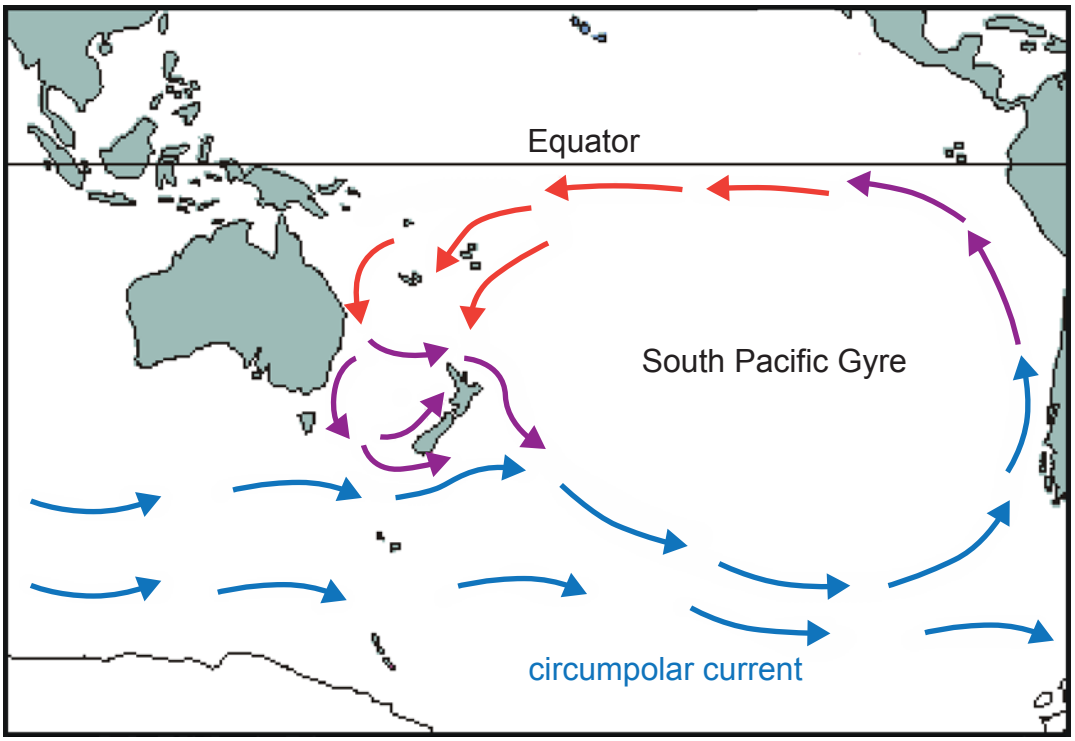
The South Pacific Gyre is one of the five major oceanic gyres. A gyre is a rotating ocean current. Floating debris that enters a gyre from other parts of the ocean tends to remain in it and accumulate.




Adapted from: www.seafriends.org.nz/issues/res/pk/ecology.htm

Explain the ocean processes that contribute to the formation of the South Pacific Gyre and the transport of matter (debris) thousands of kilometres across the ocean to accumulate in the gyre.

You may include annotated diagrams to help your answer.

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

ASSESSOR'S USE ONLY

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

QUESTION NUMBER

ASSESSOR'S USE ONLY

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