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Level 2 Earth and Space Science, 2015

91193 Demonstrate understanding of physical principles related to the Earth System

9.30 a.m. Tuesday 10 November 2015
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of physical principles related to the Earth System.	Demonstrate in-depth understanding of physical principles related to the Earth System.	Demonstrate comprehensive understanding of physical principles related to the Earth 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 2–11 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: EFFECT OF INCREASING CARBON DIOXIDE CONCENTRATION ON THE EARTH'S TEMPERATURES

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The diagram below shows the greenhouse gas carbon dioxide, CO_2, as model molecules in the atmosphere.

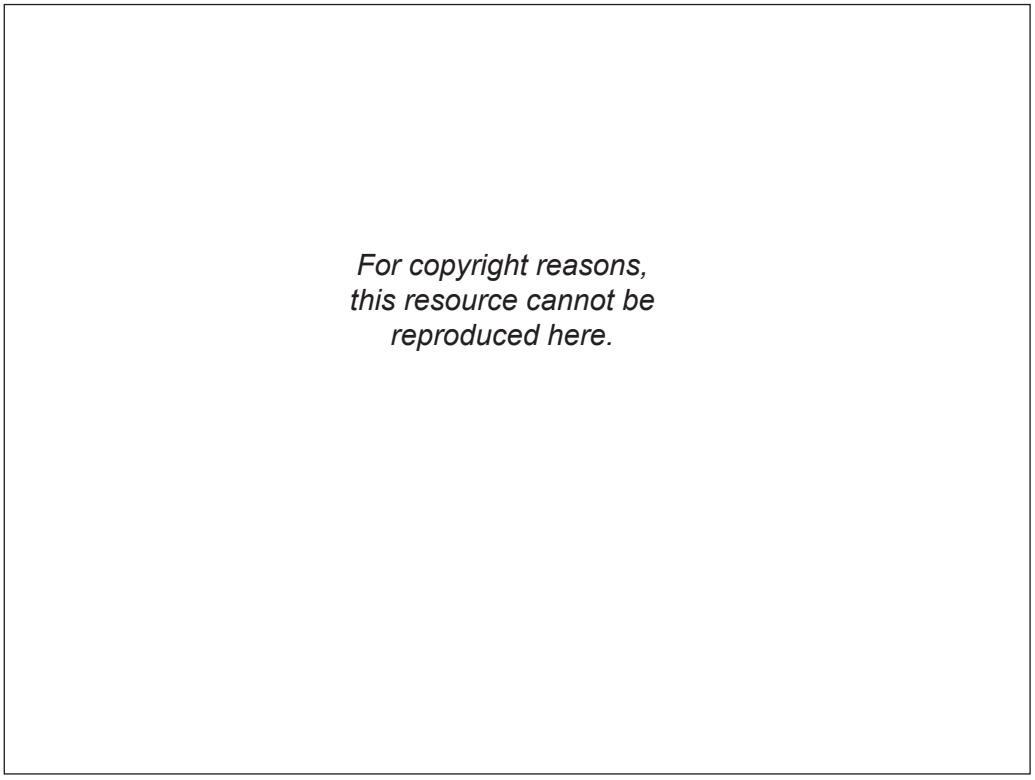

Diagram 1 **Diagram 2**

Source: http://scied.ucar.edu/longcontent/greenhouse-effect

Explain in detail the effect on the average temperature of the Earth of increasing the number of carbon dioxide molecules in the atmosphere.

In your answer you should refer to:

- how heat is transferred from the Earth through the atmosphere (see letters A, B, and C on the first diagram)
- how a carbon dioxide molecule transfers heat
- how increasing numbers of carbon dioxide molecules in the atmosphere affect the Earth's temperature.

An annotated diagram will assist your answer.

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QUESTION TWO: ONSHORE WINDS

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Source: http://onebigphoto.com/windswept-trees-new-zealand/

Often in a coastal area sunny, hot afternoons are accompanied by a wind from the sea (onshore wind) that makes the location windy. On cooler stormy days the wind may come from any direction, and not just onshore.

Use the fact that land and sea heat up at different rates to explain in detail how an onshore wind comes about on a sunny, hot day.

In your answer, you should:

- explain how the Sun heats the land and the ocean
- relate the temperature of the air to high or low pressure
- draw a diagram to show the direction of air flow for onshore winds
- explain the direction of the air flow or onshore wind, in terms of the uneven heating of the land and the ocean
- explain the origin of a storm's wind in terms of air pressure.

An annotated diagram will assist your answer.

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More space for this answer is available on the next page.

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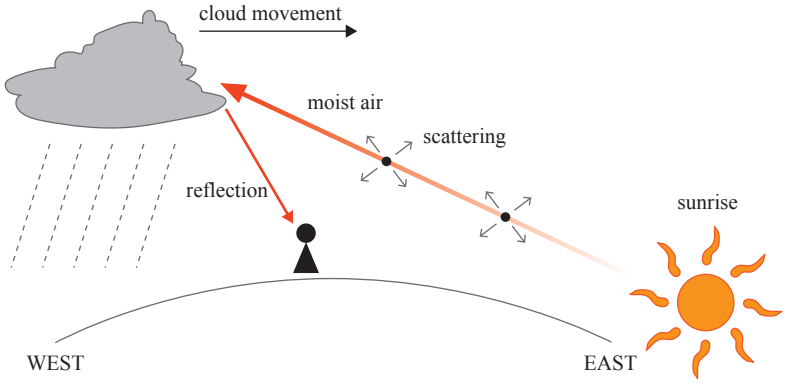
QUESTION THREE: RED SKY

There is an old weather saying that many people use:

Red sky at night, Shepherd's delight.
Red sky in the morning, Sailor's warning.

Morning photo at Aoraki Mt Cook National Park in July 2014.



Adapted from: http://www.hko.gov.hk/education/edu01met/wxphe/ele_redskye.htm

Sunlight that reaches Earth is made up of three primary colours: red, green, and blue.

Explain in detail why a red sky in the **morning** could signal that bad weather is coming.

In your answer, you should consider:

- the relative wavelengths of the primary colours of white light
- how light travels in the atmosphere
- effect of particles in the air, e.g. water, on the **scattering** of light
- effect of particles in the air, e.g. water, on the **transmission** of light.

An annotated diagram will assist your answer.

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More space for this answer is available on the next page.

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

QUESTION NUMBER

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