Level 3 Earth and Space Science: practice paper 2026

AS 91414 Demonstrate understanding of processes in the atmosphere system · Vertex Academy practice paper, not an NZQA paper

Attempt ALL the questions. Show ALL working. Write your answers on lined paper, or in the space under each question.

QUESTION ONE

(a) New Zealand lies between about 34°S and 47°S, and most of its weather arrives from the west. Discuss why New Zealand lies in a belt of westerly winds.
In your answer, consider:
• why the Sun heats the Earth unevenly
• the Hadley cell and the subtropical high-pressure belt
• the Ferrel cell and the Coriolis effect
• why the winds over New Zealand blow from the west.

QUESTION TWO

(a) A north-west wind blows moist air from the Tasman Sea over the Southern Alps. It rains heavily on the West Coast, while Canterbury has a hot, dry nor'wester.

A worked example, using typical rates of cooling and warming: air at 18 °C at sea level on the West Coast cools at about 10 °C per km as it rises, until it becomes saturated at 800 m. It then cools at about 6 °C per km up to 2500 m. It descends to Christchurch, near sea level, warming at about 10 °C per km.

Discuss why the air reaches Christchurch much warmer and drier than it was on the West Coast.

In your answer, consider:

- why rising air cools and sinking air warms
- why the rate of cooling changes once the air is saturated
- the role of latent heat
- the temperature of the air at each stage.

QUESTION THREE

(a) NIWA has measured carbon dioxide at Baring Head, near Wellington, since December 1972. The level then was about 326 parts per million (ppm); the average for 2023 was 416 ppm.
Discuss how the increase in carbon dioxide affects the Earth's energy balance and leads to warming.
In your answer, consider:
• incoming shortwave and outgoing longwave radiation
• how greenhouse gases interact with radiation
• the effect of more carbon dioxide on the energy balance
• feedbacks that can strengthen the warming.

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