

Assessment Report

Level 3 Earth and Space Science 2017

Standards [91413](#) [91414](#)

Part A: Commentary

In general, candidates attempted all questions, and provided diagrams where asked for. Most candidates appear to be reading the question more carefully and using the resources provided. Some candidates appeared to have studied past papers and then reproduced the answers, even though these were not related to the 2017 questions. The use of diagrams by candidates has improved, with many candidates using them to support their answers. Where diagrams are used, candidates should be encouraged to annotate them as much as possible and refer back to them in their written response.

Part B: Report on standards

91413: Demonstrate understanding of processes in the ocean system

Candidates who were awarded **Achievement** commonly:

- gave the correct direction of surface currents on both sides of an ocean basin
- linked wind to current formation
- explained a carbon reaction in the physical carbon pump
- explained the storage of carbon in food chains
- linked limestone to the long term storage of carbon in the ocean
- used a diagram to explain the physical and biological carbon pumps
- linked global warming to declining sea ice
- explained the relationship between ocean density and temperature
- explained the effect of sea ice formation and/or melting to changes in surface salinity.

Candidates who were assessed as **Not Achieved** commonly:

- linked upwelling and/or downwelling to incorrect locations within the ocean
- explained El nino and La nina to explain difference in temperature on two sides of the ocean
- explained the terrestrial carbon pumps
- stated that water absorbed carbon dioxide
- stated that phytoplankton were formed by photosynthesis
- explained only one stage of a single carbon pump
- explained declining sea ice in terms of the greenhouse effect
- stated that sea ice stored salt.

Candidates who were awarded **Achievement with Merit** commonly:

- explained differences in fishing in terms of upwelling/downwelling and nutrient levels
- explained how upwelling/downwelling occurs
- explained the biological pump
- explained the link between the biological and physical carbon pumps
- explained the link between the melting of sea ice decreasing the ocean salinity leading to decreased downwelling
- explained the links between sea ice and salinity and density
- explained brine formation and downwelling in the thermohaline current.

Candidates who were awarded **Achievement with Excellence** commonly:

- explained the link between the movement of water, in terms of the eastern and western boundary currents, and the climate/water temperatures and fishing on each side of the ocean
- explained the physical and biological carbon pumps using annotated diagrams to explain the link between the two pumps
- explained the effect of sea ice on the thermohaline current, in terms of salinity and density, and how a decline in sea ice will affect the thermohaline current.

Standard specific comments

Many candidates do not appear to understand the link between climatic conditions and latent heat.

Candidates struggled to explain the physical pump, generally only being able to give one chemical reaction occurring within it.

Many candidates did not consider the role of temperature on the thermohaline current.

91414: Demonstrate understanding of processes in the atmosphere system

Candidates who were awarded **Achievement** commonly:

- annotated the diagram of the convection cells with at least two correct parts
- explained a convection cell in terms of warm air rising/cool air falling due to solar heating
- explained the unequal heating of the Earth by the Sun
- explained the movement of air in the Hadley Cell, including the effect of the earth's rotation on surface winds
- explained an aerosol in terms of solid particles and size
- explained why aerosols may not be long lasting in the troposphere, due to rain and particle size
- explained how aerosols cooled Earth's climate by cloud formation and the albedo effect on incoming radiation
- explained the role of greenhouse gases on the warming of Earth's climate, in terms of 'reflecting' outgoing radiation
- linked an increase in greenhouse gases to an increase in water evaporation, and subsequent global warming.

Candidates who were assessed as **Not Achieved** commonly:

- identified Hadley and Polar cells as closed and Ferrel cells as open

- incorrectly labelled the direction of surfaces
- described convection cell formation without linking to solar heating and/or the Coriolis effect
- described the uneven heating of the Earth in terms of the Earth's tilt
- described the Hadley cell in terms of the water cycle and change in pressure
- stated aerosols were gases
- incorrectly identified the layers of the atmosphere where aerosols can be found
- linked eruption size to global and regional climates with no reasons given
- linked eruptions and/or greenhouse gases to the destruction of ozone, leading to climate change
- described the Greenhouse effect as an 'insulating blanket' or layer of gases that 'traps' heat in the atmosphere
- described the social effects of climate change, as a result of increased greenhouse gas emissions, with little or no reference to the physical systems or principles.

Candidates who were awarded **Achievement with Merit** commonly:

- explained the uneven heating of the Earth's surface in terms of the amount of solar radiation falling on the surface per square metre
- explained air movement in the Hadley and Polar cells in terms of relative heating, changes in air density and the Coriolis effect
- explained why the Hadley and Polar cells are closed cells
- explained how the Ferrel cell was influenced by the Hadley and Polar cells, and why it was open
- explained the effects of volcanic aerosols in the troposphere causing regional climate change due to their longevity
- explained the effects of greenhouse gases in the atmosphere on incoming and outgoing solar radiation
- explained how changes in Earth's climate would generate a feedback system that would subsequently enhance global warming.

Candidates who were awarded **Achievement with Excellence** commonly:

- explained the links in air movement between all three convection cells, with reference to the formation of the Ferrel cell and why it was an open cell
- explained the link between the air movement in all three convection cells and the warming of air from the surface or by solar radiation, and the behaviour of the surface winds to the Coriolis effect
- explained the effects on regional/global weather and climate due to volcanic aerosols and the physical reasons behind the changes
- explained the role of greenhouse gases and the effect of greenhouse gas emissions on the atmosphere in terms of incoming and outgoing solar radiation
- explained both positive and negative feedback systems on global climate in terms of the physical principles involved.

Standard specific comments

Candidates appear to have a poor understanding of stratospheric winds and the behaviour of sulfates as aerosols.

Many candidates were familiar with feedback systems and their effect on climate variation.

A significant number of candidates do not appear to understand that greenhouse gases are spread throughout the atmosphere, with many holding the misconception that greenhouse gases form a layer in the atmosphere, which acts as a reflective barrier to outgoing radiation and/or sunlight, trapping the outgoing heat or light and acting as an insulation layer.

Previous years' reports

[2016 \(PDF, 0KB\)](#)

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