Assessment schedule: practice paper 2026

AS 91193 Demonstrate understanding of physical principles related to the Earth System · Vertex Academy practice paper, not an NZQA paper

QUESTION ONE

Part	Evidence	Achievement (u)	Merit (r)	Excellence (t)
(a)	heat left over from the Earth's formation radioactive decay of uranium, thorium and potassium conduction: particle to particle through a material convection: heated fluid becomes less dense and rises radiation: electromagnetic waves, no material needed	Describes radioactive decay (or heat from formation) as a source of internal heat. Describes conduction, convection and radiation correctly.		
(b)	rock near the core heated same mass, more volume spreads under the plates and cools denser rock sinks back to the core	Describes heated rock rising and cooler rock sinking. Describes heating making rock less dense.	Explains that heating makes rock expand and become less dense so it rises, and cooling makes it denser so it sinks, forming a convection current.	
(c)	density depends on temperature and salinity cooled by the air sea ice leaves salt behind densest water sinks warm surface water flows in to replace it thermohaline circulation evens out temperatures	Describes cold water as denser. Describes saltier water as denser. Describes the dense water sinking. Describes warm water moving towards the poles.	Explains how cooling and sea ice formation both increase the density of the water, so it sinks, OR explains that sinking water is replaced by warm surface water moving towards the poles.	Discusses why the water sinks, linking temperature AND salinity to density, AND discusses how the sinking drives a circulation that transfers heat around the Earth.

QUESTION TWO

Part	Evidence	Achievement (u)	Merit (r)	Excellence (t)

(a)	sunlight: mostly visible, some UV and infrared absorbed by the ground and sea warm surface emits infrared, a longer wavelength night: no sunlight in, infrared still out	Describes the surface absorbing radiation from the Sun. Describes the surface emitting infrared (longwave) radiation. Describes the surface cooling at night because it keeps emitting with nothing coming in.		
(b)	water's heat capacity about 5 times sand's warm land heats the air by conduction low pressure over the land cooler denser air over the sea, higher pressure aloft it returns, cools and sinks	Describes the land heating faster than the sea. Describes warm air rising over the land. Describes cooler air moving from the sea to the land.	Explains that the lower heat capacity of the land makes it warm faster, OR explains that air heated over the land becomes less dense and rises, lowering the pressure so cooler sea air flows in.	
(c)	January: 22.4 − 12.3 = 10.1 °C against 17.0 − 12.5 = 4.5 °C July: 7.8 − (−1.1) = 8.9 °C against 9.6 − 5.3 = 4.3 °C Alexandra: low heat capacity land Dunedin: sea's heat capacity about 5 times land's, mixed deep air off the sea takes its steady temperature coastal cloud and moisture slow heating and cooling	Calculates or describes the daily ranges. Describes land heating and cooling faster than the sea. Describes Dunedin's air coming from the sea.	Explains the difference using heat capacity, OR explains how the sea keeps the air over Dunedin at a steady temperature.	Discusses why the daily range differs, linking heat capacity and heat transfer over land and sea to the temperatures in both January and July.

QUESTION THREE

Part	Evidence	Achievement (u)	Merit (r)	Excellence (t)

(a)	red, orange, yellow, green, blue, indigo, violet red: longest wavelength, about 700 nm towards violet: shorter wavelength, higher frequency violet: shortest wavelength, about 400 nm	Describes the order of the colours. Describes red as the longest wavelength and violet the shortest. Describes frequency rising as wavelength falls.		
(b)	sunlight: all colours air molecules much smaller than a wavelength of light short wavelengths scattered most blue (450 nm) scattered about 6 times as much as red (700 nm) blue scattered across the whole sky	Describes blue light as having a short wavelength. Describes blue light being scattered by the air.	Explains that gas molecules scatter short wavelengths much more than long ones, so blue light is scattered across the sky and reaches us from every direction.	
(c)	blue about 450 nm, short; red about 700 nm, long gas molecules scatter short wavelengths most midday: high Sun, short path sunset: low Sun, much longer path direct light mostly orange and red smoke: more particles same scattering, longer path	Describes blue light as short wavelength and red as long. Describes blue light being scattered more. Describes sunlight travelling through more air at sunset.	Explains why the sky is blue using the greater scattering of short wavelengths, OR explains that the longer path at sunset scatters out the blue, leaving red.	Discusses the change from midday to sunset by comparing the path lengths with the same scattering process, AND explains the deeper red caused by smoke.

Judgement for each question

N0	N1	N2	A3	A4	M5	M6	E7	E8
No response, or nothing relevant.	One Achievement point, partly described.	Two Achievement points.	Three Achievement points.	Four Achievement points.	One Merit point.	Two Merit points.	One Excellence point, with a minor error or omission.	One Excellence point, complete.

Grade score out of 24 (each question's grade: N0 = 0 to E8 = 8): Not Achieved 0 to 6, Achieved 7 to 12, Merit 13 to 18, Excellence 19 to 24 (the 2025 exam's cut scores).