# Assessment schedule: practice paper 2026

AS 91413 Demonstrate understanding of processes in the ocean system · Vertex Academy practice paper, not an NZQA paper

## QUESTION ONE

| Part | Evidence | Achievement (u) | Merit (r) | Excellence (t) |
|---|---|---|---|---|
| (a) | wind drags the surface water<br>Coriolis effect deflects moving water to the left in the Southern Hemisphere<br>Ekman transport: about 90° to the left of the wind<br>wind north along the coast<br>replaced from below<br>deep water is nutrient-rich<br>nutrients plus sunlight<br>winds blow most of the year | Describes the Coriolis effect deflecting water to the left in the Southern Hemisphere. Describes surface water moving away from the coast. Describes upwelling as deep, cold water rising. Describes deep water as rich in nutrients. | Explains how Ekman transport moves surface water offshore so that deep water rises to replace it. Explains why deep water is rich in nutrients. Explains how nutrients and sunlight increase phytoplankton growth and so the food web. | Discusses the whole process, linking the wind direction, Coriolis effect and Ekman transport to upwelling, AND linking the nutrient supply to productivity, including why the supply depends on the winds continuing. |

## QUESTION TWO

| Part | Evidence | Achievement (u) | Merit (r) | Excellence (t) |
|---|---|---|---|---|
| (a) | $CO_2$ dissolves from the air<br>solubility pump: cold water holds more; sinking water carries carbon down<br>biological pump: photosynthesis, then sinking dead organisms and waste<br>$CO_2 + H_2O \rightarrow H_2CO_3 \rightarrow H^+ + HCO_3^-$<br>pH 8.2 to 8.1: 10 to the power 0.1 ≈ 1.26<br>$H^+ + CO_3^{2-} \rightarrow HCO_3^-$<br>$Ca^{2+} + CO_3^{2-} \rightarrow CaCO_3$ harder to make<br>shellfish feed others and support aquaculture | Describes $CO_2$ dissolving in sea water. Describes the solubility pump or the biological pump. Describes $CO_2$ making the ocean more acidic (lower pH). Describes shells being made of calcium carbonate. | Explains how the solubility and biological pumps move carbon into the deep ocean. Explains how dissolved $CO_2$ forms carbonic acid and releases hydrogen ions, lowering pH. Explains how extra hydrogen ions reduce carbonate ions, making shell-building harder. | Discusses the whole chain from $CO_2$ uptake through the pumps, the chemistry and the fall in pH (including what a 0.1 change means) to the effects on shell-building organisms and the wider ecosystem. |

## QUESTION THREE

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

| | | | | |
|---|---|---|---|---|
| (a) | normal: trade winds east to west<br>thermocline deep in the west, shallow in the east<br>rising air and rain over the warm west, sinking dry air in the east<br>El Niño: trade winds weaken<br>thermocline deepens in the east, flattens<br>fisheries off South America decline<br>NZ: more westerly and south-westerly winds<br>a tendency, not a certainty | Describes the trade winds blowing warm water west in a normal year.<br>Describes the thermocline as deep in the west and shallow in the east.<br>Describes the trade winds weakening in an El Niño.<br>Describes a New Zealand effect (more westerlies or south-westerlies, cooler, drier east). | Explains how weaker trade winds let warm water spread east and the thermocline flatten. Explains why upwelling off South America brings warmer, nutrient-poor water.<br>Explains how the shift in warm water moves the region of rising air and rain. | Discusses the change from normal to El Niño conditions, linking winds, warm water, the thermocline and upwelling, AND links the change in the Pacific to New Zealand's winds and weather. |

## Judgement for each question

| N0 | N1 | N2 | A3 | A4 | M5 | M6 | E7 | E8 |
|---|---|---|---|---|---|---|---|---|
| No response, or nothing relevant. | One idea described at Achievement level. | Two ideas described at Achievement level. | Three ideas described at Achievement level. | Four ideas described at Achievement level. | Two ideas explained at Merit level. | Three ideas explained at Merit level. | The question discussed at Excellence level, with a minor error or omission. | The question discussed at Excellence level, complete. |

Grade score out of 24 (each question's grade: N0 = 0 to E8 = 8): Not Achieved 0 to 7, Achieved 8 to 13, Merit 14 to 18, Excellence 19 to 24 (the 2025 exam's cut scores).