Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

2.1

hydraulic action: the force of water, and air compressed in cracks, breaks the rock apart; abrasion: rocks and sand carried by waves are thrown against the cliff and wear it away

2.2

$70 \div 2 =$ **35** years; any one: storms remove large pieces in one event / sea-level rise / groynes up the coast reduce the sand reaching this beach

2.3

the area of sea up to 200 nautical miles from a country's coast; in which the country controls resources such as fishing, oil and gas

2.4

waves approach at an angle, set by the main wind direction; the swash carries sand up the beach at that angle, and the backwash pulls it straight back down the slope; repeated many times, the sand moves in a zig-zag along the coast in the direction of the main waves

2.5

any two, explained: roots slow waves and hold mud, so they protect coasts from storms and erosion; nurseries for young fish, which supports fishing and food; they store large amounts of carbon in mud, which helps limit climate change; wood, honey and tourism give income to local people

3.1

(a) from north to south; sand has built up on the north side of each groyne

(b) the groynes trap sand moving south by longshore drift; so less sand reaches the beach further south; a smaller beach absorbs less wave energy; so more wave energy reaches the soft clay cliffs, which erode faster (the Mappleton effect on Holderness)

3.2

Mark with the markbands: [9-10] focused on the command term, detailed and accurate knowledge, well-developed explanation, specific named examples (places, dates, numbers), balanced evaluation and a supported conclusion; [7-8] mostly focused, good knowledge and examples, some evaluation; [5-6] relevant knowledge and examples, explanation partly developed, little evaluation; [3-4] general knowledge, few examples, mostly description; [1-2] little that is relevant. Points that may be included: managed realignment works with nature: at Medmerry (2013) defences were moved inland and a salt marsh formed; the marsh absorbs wave energy and protects homes behind it, and creates habitat for birds; cheaper over time than repairing hard defences as sea levels rise; but farmland and some homes are lost, and owners may not be paid enough; it needs low, empty land, so it does not suit cities or ports; hard engineering protects high-value places: sea walls

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and groynes protected Mappleton village; but hard defences are costly, reflect waves and move erosion along the coast; mangrove planting is a soft option on tropical coasts; conclusion: realignment is the best choice for low-value rural coasts, but cities will still need hard defences, so a mix will be used