3.2 Option: Oceans and coastal margins

Name: _____ Class: _____ Date: _____ **Total: 30 marks**

KEY WORDS hydraulic action • abrasion • longshore drift • groyne • beach nourishment • managed realignment • exclusive economic zone

Objective

Build the skills to answer Paper 1 questions on the **oceans and coastal margins** option: wave erosion and deposition, coastal landforms, **longshore drift** , coastal management, mangroves and coral reefs, and who controls and uses the oceans.

You must be able to:

- explain hydraulic action and abrasion, and how headlands, bays, caves, arches and stacks form
- explain longshore drift and its effect on coastal defences
- evaluate sea walls, groynes, beach nourishment, mangroves and managed realignment
- calculate a rate of cliff retreat and its effect on a place
- explain the value of mangroves and coral reefs and the threats to them
- explain exclusive economic zones

1 Key knowledge and worked examples

Processes and landforms

- **Hydraulic action** : water and air forced into cracks. **Abrasion** : rocks thrown against the cliff. Where waves lose energy they **deposit** sand and shingle: beaches and **spits** .
- Where hard and soft rocks meet the sea, soft rock erodes into **bays**; hard rock is left as **headlands**, where cracks become caves → arches → stacks.
- **Longshore drift**: waves move sand along the coast in the direction of the main wind and waves (swash up the beach at an angle, backwash straight down). So defences in one place affect the next place.

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strategy	how it works	problem
sea wall	reflects waves	expensive; beach in front is eroded
groyne	traps drifting sand	coast further along gets less sand
beach nourishment	sand added	repeated every few years
mangrove planting	roots hold mud, slow waves	needs warm, sheltered coasts and time
managed realignment	old defences removed; sea floods low land → salt marsh	farmland and some homes lost

Case study: Holderness, England. Soft clay cliffs lose about **2 m a year** on average. Groynes at Mappleton (1991) protected the village, but cliffs to the south then eroded faster. At **Medmerry** (2013) defences were moved inland; the new salt marsh protects homes and is a bird habitat.

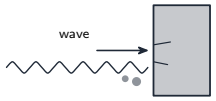
Ocean ecosystems and ownership

Mangroves and coral reefs protect coasts from waves, are nurseries for fish and store carbon. Threats: clearing for shrimp farms and tourism, pollution, warmer and more acidic water (coral bleaching). Under the UN Convention on the Law of the Sea, a country controls fishing, oil and gas in its **exclusive economic zone** (EEZ) , up to 200 nautical miles from its coast.

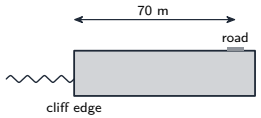
Worked example. A cliff retreats 2 m a year. A house is 46 m from the edge. Time until the edge reaches it $\approx 46 \div 2 = 23$ years (sooner if storms or sea-level rise speed up erosion).

2 Practice

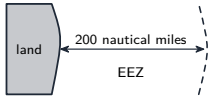
2.1 Distinguish between **hydraulic action** and **abrasion**. [2]



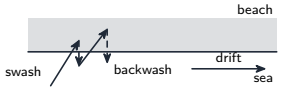
2.2 A cliff on the Holderness coast retreats about 2 m a year. A road is 70 m from the cliff edge. Calculate how many years it will take for the edge to reach the road, and give **one** reason why it could be sooner. [3]



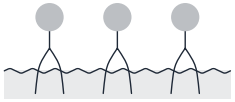
2.3 Define an **exclusive economic zone** (EEZ). [2]



2.4 Explain how **longshore drift** moves sand along a beach. [3]



2.5 Explain **two** ways in which mangrove forests are valuable to people. [4]



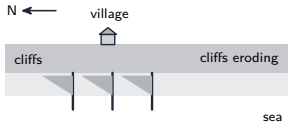
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3 Exam-style questions

3.1 *(Paper 1 style.)* The diagram shows a coast where groynes were built to protect a village.

(a) Using the diagram, identify the direction of longshore drift and give **one** piece of evidence. [2]

(b) Explain why the cliffs south of the groynes are eroding faster than before. [4]



3.2 "Managed realignment is the best way to manage coasts in the future." Discuss this statement. [10]

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 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

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