3.8 Coastal Transportation, Deposition and Landforms

AQA 8035 · Calculator allowed · about 50 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Resource C is a fictional coast running west to east, with land to the north and sea to the south. Waves arrive FROM the south-west, moving north-east, and loose sand and shingle are supplied continuously from the west. At its eastern end the coast turns sharply north beside an inlet. Wave energy falls in the sheltered water beyond the bend. Explain how a spit could start to grow at this bend, including its initial direction of growth.

(Total for Question 1 is 4 marks)

2 Resource D is a separate fictional bay. Its mouth lies on an east-west line, with sea to the south and land to the north. Waves arrive FROM the south-west towards the north-east, producing eastward drift. Abundant sand and shingle arrive from the west. An eastern headland forms the opposite side of the bay mouth. A ridge is already growing eastwards from the western headland across the shallow bay mouth. Water near the ridge tip has low energy; cross-mouth currents are weak and no river maintains an open channel. Explain how a bar and a lagoon could form.

(Total for Question 2 is 4 marks)

3 Compare two supplied situations. At inlet P, a sand ridge extends from one side of the mouth and ends in open water; a strong river current keeps the remaining channel clear. At bay Q, a ridge joins the two headlands and encloses water; sediment supply was abundant and cross-mouth currents were weak. Identify each landform and explain why only Q became a complete barrier.

(Total for Question 3 is 4 marks)

4 A fictional spit has a sheltered inlet behind it. Fine mud is supplied in suspension, the water moves slowly and a shallow bed is exposed at low tide. Explain how a mudflat could form there and later support salt-marsh development if salt-tolerant plants colonise.

(Total for Question 4 is 4 marks)

5 Explain how a sandy beach and dunes can build up together under the following fictional conditions. The coast runs east to west, with sea to the south. Waves arrive directly FROM the south at right angles to the coast. Offshore sand is available; swash brings more sand onto the beach than backwash removes. Some upper-beach sand dries above the high-tide line. Wind blows FROM the south towards the land strongly enough to move this dry sand, and pioneer plants are present. Link the processes in your explanation.

(Total for Question 5 is 6 marks)

6 Explain how longshore drift could build a spit that later becomes a bar in this fictional bay. The mouth lies east to west, with sea to the south and land to the north. Waves approach FROM the south-west towards the north-east. Sand and shingle are supplied continuously from the west. The shore turns north at the western headland; beyond it, water is shallow and wave energy is lower. No river or strong tidal current keeps the bay mouth open. Continued deposition can eventually carry the ridge to the eastern headland. Include the drift direction and the change in the landform.

(Total for Question 6 is 6 marks)

7 Describe how traction and saltation move beach sediment.

(Total for Question 7 is 2 marks)

8 Resource A is a fictional plan-view scenario. A straight coastline runs north to south, with land to the west and sea to the east. Waves approach FROM the north-east, travelling towards the south-west. Loose sand is available. Swash follows that approach direction up the beach; backwash flows straight down the slope at right angles to the shore. State the net direction of longshore drift and explain it using swash and backwash.

(Total for Question 8 is 3 marks)

9 Sand-laden water enters a sheltered inlet where waves are smaller and the water slows down. Explain why sand is deposited there. Link the energy change to sediment transport.

(Total for Question 9 is 3 marks)

10 Resource B contains invented beach sediment measurements for one five-day period. All volumes are in cubic metres. Longshore input: 1840. Longshore output: 1275. There are no other inputs or outputs and no compaction. Calculate the mean daily net gain of sediment. Show your working and give the unit.

(Total for Question 10 is 3 marks)

11 A fictional coast runs east to west, with sea to the south and land to the north. There is a broad supply of dry sand above the high-tide line. Wind blows FROM the south towards the north, strongly enough to move sand, and pioneer plants grow on the upper beach. Explain how small dunes can develop and become more stable.

(Total for Question 11 is 4 marks)

Mark scheme · 3.8 Coastal Transportation, Deposition and Landforms

Question 1

Eastward longshore drift, consistent with north-east swash and southward backwash. **B1**

The drift supplies sand and shingle to the bend where the shore turns north. **B1**

Lower energy beyond the bend causes sediment deposition. **B1**

Continued deposition builds a ridge extending east into the inlet, attached to the land at one end. **B1**

Answer: Swash carries sediment north-east and backwash returns south, so longshore drift is eastwards. Sediment reaches the coastline bend and enters lower-energy water. It is deposited beyond the bend and accumulates as an eastward-growing ridge attached to the land at its western end.

Question 2

Reduced energy at the tip permits sediment deposition. **B1**

Continued eastward sediment supply lengthens the ridge across the mouth; weak currents allow accumulation. **B1**

The ridge reaches the opposite headland, forming a bar attached at both ends. **B1**

Water is enclosed behind the bar as a lagoon. **B1**

Answer: Low-energy water deposits the supplied sediment at the ridge tip. Continued eastward supply allows the ridge to grow across the mouth. It can reach the eastern headland, joining land at both ends to form a bar. Water enclosed behind it forms a lagoon.

Question 3

P is a spit, attached to land at only one end. **B1**

Q is a bar, joining land at both ends across the bay mouth. **B1**

At P the strong river current keeps the channel open by carrying sediment away or preventing accumulation. **B1**

At Q continued supply and weak currents allow deposition to complete the barrier. **B1**

Answer: P is a spit and Q is a bar. The river current at P removes sediment or prevents it accumulating across the channel. At Q, abundant sediment and weak currents allowed a ridge to join both sides and close the bay mouth.

Question 4

Shelter and slow water reduce energy sufficiently for deposition. **B1**

Fine sediment settles from suspension and accumulates on the intertidal bed as a mudflat. **B1**

Salt-tolerant pioneer plants colonise suitable mud exposed at low tide. **B1**

Plants trap further sediment or bind it with roots, helping a salt marsh develop. **B1**

Answer: Shelter and slow water reduce energy. Fine suspended particles settle and accumulate as an intertidal mudflat. Salt-tolerant plants colonise suitable exposed mud. They trap more sediment and bind it with roots, helping a salt marsh develop.

Question 5

Swash transfers available sand from offshore onto the beach. **B1**

More sand arrives than leaves, causing net deposition and beach growth. **B1**

Upper-beach sand dries above high tide, providing loose sand for wind transport. **B1**

Onshore wind carries dry sand inland, by saltation or surface creep. **B1**

Plants slow the wind or obstruct moving grains, causing sand to accumulate as dunes. **B1**

Roots bind the sand, helping stabilise the growing dunes. **B1**

Credit equivalent valid linked explanations, up to six marks.

Answer: Swash brings available offshore sand onto the shore. Because backwash removes less, there is a net gain of deposited sand and the beach builds up. Sand above high tide can dry, making it easier for wind to move. The onshore wind carries dry grains inland by saltation. Pioneer plants slow the wind and trap sand, building dunes. Their roots bind the sand and help stabilise the dunes.

Question 6

North-east swash carries available sand and shingle obliquely up the beach. **B1**

Southward perpendicular backwash under gravity leaves net eastward longshore drift. **B1**

Drift delivers sediment beyond the bend at the western headland. **B1**

Lower-energy water cannot transport as much sediment, so deposition occurs. **B1**

Continued sediment supply extends an eastward spit, attached at one end. **B1**

Without a strong current keeping the mouth open, the ridge can join the eastern headland as a bar; accept linked enclosure of a lagoon. Credit equivalent valid linked explanations, up to six marks. **B1**

Answer: Waves drive swash north-east, carrying sand and shingle up the beach. Gravity returns backwash southwards at right angles to the shore, leaving net eastward longshore drift. At the bend the drift delivers sediment beyond the western headland into lower-energy water. Sediment is deposited because the water has less energy to transport it. Continued supply builds an eastward spit attached to the western headland. With no strong current maintaining an opening, deposition can join the ridge to the eastern headland, making a bar with a lagoon behind it.

Question 7

Traction: particles roll or slide along the bed. **B1**

Saltation: particles bounce or hop along the bed. **B1**

Answer: Traction rolls larger particles along the bed. Saltation moves smaller particles in short hops along the bed.

Question 8

Southwards along the coast. **B1**

Swash has a southward component as it travels south-west up the beach carrying sand. **B1**

Backwash returns perpendicular to the shore, eastwards under gravity; repeated cycles therefore retain a southward displacement. **B1**

Answer: Net drift is southwards. Swash carries sand towards the south-west, so it moves sand south as well as up the beach. Backwash returns eastwards under gravity without cancelling that southward movement. Repetition moves sand south along the coast.

Question 9

Shelter or slowing water reduces the available energy. **B1**

Reduced energy means less ability to transport sand or keep it moving. **B1**

Sand settles or is laid down when the water can no longer carry it. Accept a linked explanation of larger grains being deposited first. **B1**

Answer: Shelter reduces wave energy and the water slows. The water has less energy to keep sand moving. Sand is laid down when the water can no longer transport it.

Question 10

Subtract output from input: 1840 - 1275 = 565 cubic metres. **M1**

Divide the net gain by the full five-day period: 565 / 5. **M1**

113 cubic metres per day net gain; accept m^3/day. A correct answer with unit earns all three marks. **A1**

Answer: 113 cubic metres per day net gain.

Question 11

Onshore wind transports the dry sand inland by saltation or surface creep; accept bouncing or rolling. **B1**

Pioneer plants slow wind locally or act as obstacles, causing sand to accumulate. **B1**

Continued deposition builds the trapped sand into a mound or dune. **B1**

Roots bind the sand, reducing its movement and stabilising the dune. **B1**

Answer: The onshore wind blows dry sand inland by saltation or surface creep. Plants slow the wind and trap sand, creating mounds. Further trapping enlarges the mounds into dunes. Plant roots bind the sand, making the dunes more stable.