**Q1.** Which of the following are all landforms of coastal deposition?

**[1 mark]**

|  |  |  |
| --- | --- | --- |
| **A** | Beaches, barrier beaches, compound spits, offshore bars. |  |
| **B** | Beaches, caves, Dalmatian coasts, spits. |  |
| **C** | Cliffs, offshore bars, spits, tombolos. |  |
| **D** | Tombolos, rias, sand dunes, wave cut platforms. |  |

**Q2.** Explain the development of saltmarsh environments.

**[4 marks]**

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**Q3.** Assess the view that tides are the most important factor in the development of mudflats in estuarine environments.

**[9 marks]**

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**Q4.** Outline the processes which lead to the development of barrier beaches.

**[4 marks]**

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**Q5.** ‘Human activity always has a negative impact on the development of landforms of coastal deposition.’

To what extent do you agree with this view?

**[20 marks]**

**Q6.** The photograph below is of a stretch of coastline in the Mahia Peninsula, North Island, New Zealand.



Note: In New Zealand, there is a variety of coastal dune landforms. The dunes in the photograph are relatively small shore-parallel foredunes located immediately behind the beach. Dunes can be made up of a variety of surface dune types. They can form hills and ridges which can rise to a hundred metres or more above the shoreline and represent long-term accumulations of large volumes of sand.

Using the photograph and your own knowledge, assess the role of vegetation in the development of this landscape.

**[6 marks]**

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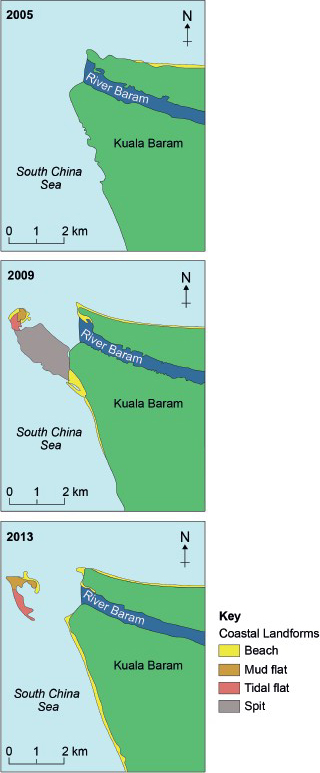
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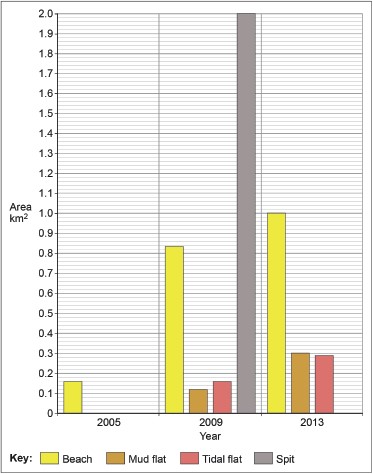
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**Q7. Figure 1** and **Figure 2** provide information about the changes in coastal landforms in the Kuala Baram region of Sarawak, East Malaysia.

**Figure 1**

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**Figure 2**

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Analyse the data shown in **Figure 1** and **Figure 2**.

**[6 marks]**

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**Q8.** Which of the following describes a Dalmatian coast?

**[1 mark]**

|  |  |  |
| --- | --- | --- |
| **A** | An emergent coastline of former wave-cut platforms and their beaches at a higher level than the current sea level. |  |
| **B** | A series of ridges on a beach running parallel to the coast marking successively higher tides between neap and spring tides. |  |
| **C** | A sheltered area on the landward side of a spit where coastal sediments accumulate and become stabilised by vegetation like marram grass. |  |
| **D** | A submergent coastline where valleys have been flooded by a rise in sea level leaving a series of islands parallel to the coastline. |  |

**Q9.** Outline the concept of eustatic sea level change.

**[3 marks]**

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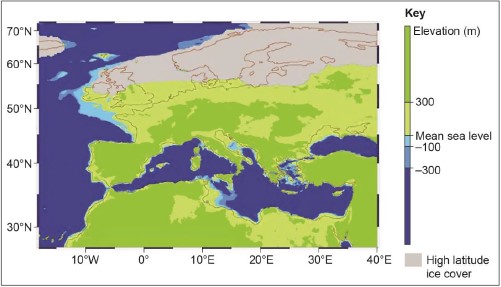
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**Q10. Figure 1** indicates sea levels relative to land 20 000 years before present.

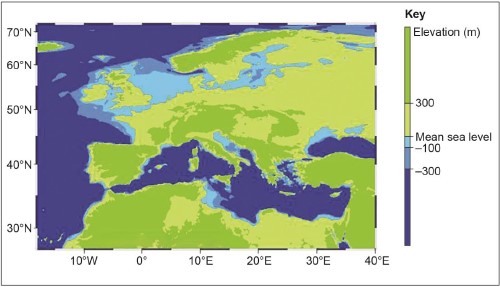
The present day coastline is indicated for comparative purposes.

**Figure 2** indicates present day sea levels.

**Figure 1**

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**Figure 2**

****

Using **Figure 1**, **Figure 2** and your own knowledge, assess the potential impact of these changes on coastal landform development in this area.

**[6 marks]**

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**Q11.** Where do salt marshes tend to develop?

**[1 mark]**

|  |  |  |
| --- | --- | --- |
| **A** | At depositional coastlines exposed to longshore drift. |  |
| **B** | In estuaries with an ample supply of sediment, often on the landward side of spits. |  |
| **C** | In high-energy environments which bring large waves and lots of sediment pushed into bays. |  |
| **D** | In places where there has been an isostatic sea level change leading to deep water lagoons in which sediment collects. |  |

**Q14.** With reference to a coastal environment at a local scale, assess the predicted impact of climate change upon the landscape.

**[20 marks]**

**Q17.** With reference to a coastal landscape from beyond the UK, assess the role of human intervention in shaping the physical environment.

**[20 marks]**

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**Q18.** Outline factors leading to the formation of fjords.

**[4 marks]**

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**Q19.** Assess the importance of different sources of energy in the creation of coastal landscapes.

**[9 marks]**

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**Q20.** Using the information below and your own knowledge, assess the role of mass movement upon the development of this area of the Holderness coastal landscape.

**[6 marks]**

|  |
| --- |
| Holderness is overlaid with unconsolidated glacial deposits which lie on top of chalk.  The landscape is dominated by deposits of till, boulder clays and glacial lake clays.  The glacial deposits form a continuous lowland plain. Rainfall is below national average but the area is prone to heavy storms. |

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**Q21.** Assess the view that wind is the biggest factor in determining the impact of energy in coastal environments.

**[9 marks]**

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**Q22.** How far do you agree that weathering processes make little contribution to the development of landscapes of coastal erosion?

**[9 marks]**

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**Q23.** The photograph below shows a landform located in the Humber Estuary, UK.



Note: This landform extends about 5 km across the Humber Estuary and is only 50 metres wide at its narrowest point. The Holderness coastline to the north comprises mainly boulder clay, which is unconsolidated material deposited at the end of the last ice age.

Using the photograph above and your own knowledge, assess the relative importance of factors leading to the development of this landform.

**[6 marks]**

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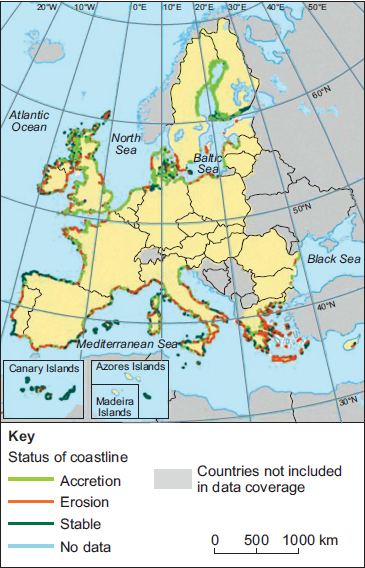
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**Q24.** Assess the relative importance of weathering and erosion in the development of coastal landscapes.

**[20 marks]**

**Q25.** The map below shows the distribution of coastal erosion and accretion (sediment build up) across selected European coastlines in 2004.



Analyse the data shown in the map above.

**[6 marks]**

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**Q26.** To what extent can an understanding of feedback systems help with the management of **one or more** coastal landscapes that you have studied?

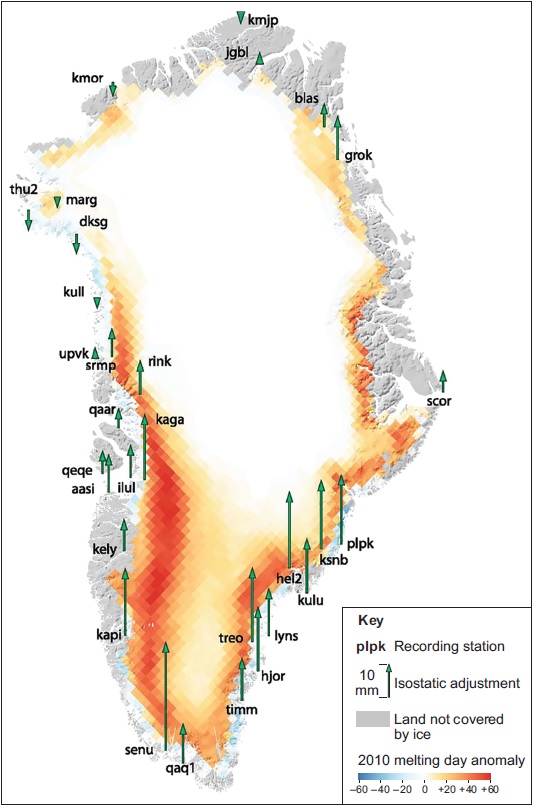
**[20 marks]**

**Q27.** What is a spit?

**[1 mark]**

|  |  |  |
| --- | --- | --- |
| **A** | A beach that is found higher than the current shoreline formed by a fall in sea level relative to the land. |  |
| **B** | A gently sloping expanse of eroded rock at the base of a cliff formed by wave erosion. |  |
| **C** | A horseshoe shaped feature on a beach composed of deposited sand and gravel with seaward facing points. |  |
| **D** | A long narrow ridge of sand or shingle with one end connected to the shore and the other extending into the sea or estuary. |  |

**Q28.** The map shows the isostatic adjustment in 2010 (green arrows) for selected recording stations in Greenland. Information on the 2010 melting day anomaly is also shown.



Analyse the relationship between isostatic adjustment and the 2010 melting day anomaly in Greenland as shown on the map above.

**[6 marks]**

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**Q29.** This is a photograph of a coastal feature, taken in Malta in 2017.



Using the photograph and your own knowledge, assess the view that rock type is the most important factor in the development of this landscape.

**[6 marks]**

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**Q30.** How far do you agree that human activity has a greater role than natural processes in shaping coastal landscapes?

**[20 marks]**

**Q31. Figure 1** is a photograph of part of the Mersey Estuary at Runcorn, Cheshire in 2019.

**Figure 1**

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Note: Runcorn lies about 25 kilometres from the sea on the south bank of the tidal estuary of the River Mersey where the tidal range can be as high as 9 metres. This particular photograph was taken at low tide looking towards the north bank of the estuary. The River Mersey ends its approximately 110 km course in this tidal estuary.

Using **Figure 1** and your own knowledge, assess the view that deposition is the most important factor in the development of this landscape.

**[6 marks]**

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**Q32.**

Assess the role of weathering in the development of coastal landforms.

**[9 marks]**

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**Q33.**

‘Submergent coastal landforms will develop faster than emergent features in the future.’

To what extent do you agree with this statement?

**[20 marks]**

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Mark schemes

**Q1.**

**A** Beaches, barrier beaches, compound spits, offshore bars.

**AO1 = 1**

**[Total 1 mark]**

**Q2.**

Point marked

Allow 1 mark per valid point with extra mark(s) for developed points (d). For example:

Notes for answers

•   Salt marshes tend to develop in sheltered estuaries behind spits (1). As the spit develops, the area behind it becomes sheltered (d).

•   Silt is deposited by the river which gradually builds up to form an inter-tidal mud flat (1). The mud flat continues to build and rise above sea level with the addition of further silt (1).

•   Vegetation which is highly adapted to environment colonises the mud which itself traps further sediment (1).

•   The salt marsh environment is colonised by halophytic vegetation (1).

**The Notes for answers are not exhaustive. Credit any valid points.**

**AO1 = 4**

**[Total 4 marks]**

**Q3.**

**AO1** – Knowledge and understanding of tides and other coastal processes including winds, waves and currents. Knowledge and understanding of the development of mudflats in estuarine environments.

**AO2** – Application of knowledge and understanding to assess the importance of tides compared to other coastal processes in the development of mudflats in estuarine environments.

Mark scheme

**Level 3 (7–9 marks)**

**AO1** – Demonstrates detailed knowledge and understanding of concepts, processes, interactions and change. These underpin the response throughout.

**AO2** – Applies knowledge and understanding appropriately with detail. Connections and relationships between different aspects of study are fully developed with complete relevance. Analysis is detailed and well supported with appropriate evidence.

**Level 2 (4–6 marks)**

**AO1** – Demonstrates clear knowledge and understanding of concepts, processes, interactions and change. These are mostly relevant, though there may be some minor inaccuracy.

**AO2** – Applies clear knowledge and understanding appropriately. Connections and relationships between different aspects of study are evident with some relevance. Analysis is evident and supported with clear and appropriate evidence.

**Level 1 (1–3 marks)**

**AO1** – Demonstrates basic knowledge and understanding of concepts, processes, interactions and change. This offers limited relevance with inaccuracy.

**AO2** – Applies limited knowledge and understanding. Connections and relationships between different aspects of study are basic with limited relevance. Analysis is basic and supported with limited appropriate evidence.

Notes for answers

**AO1**

•   Estuarine mudflat / saltmarsh environments and associated landscapes; factors and processes in their development.

•   Sources of energy in coastal environments: winds, waves (constructive and destructive), currents and tides. Low energy and high energy coasts.

•   Sediment sources, cells and budgets.

•   Geomorphological processes: weathering, mass movement, erosion, transportation and deposition.

•   Distinctively coastal processes: marine: erosion – hydraulic action, wave quarrying, corrasion / abrasion, cavitation, solution, attrition; transportation: traction, suspension (longshore / littoral drift) and deposition; sub-aerial weathering, mass movement and runoff.

•   The relationship between process, time, landforms and landscapes in coastal settings.

•   Named mudflats in estuarine environments are likely to support responses.

**AO2**

•   Tides should be considered as a key factor in the development of mudflats in estuarine environments, as if tidal currents are too strong deposition of sediments will not occur and so gentle tidal currents are essential.

•   Tides should also be considered as a key factor as they are often the agent by which sediments are transported to the coast which are then deposited forming the mudflats.

•   Expect responses to come to the view that tides do not operate in isolation and the development of mudflats in estuarine environments relies upon a combination of factors.

•   Responses should consider the combination of factors that lead to the formation of mudflats.

-   Wind and waves are an important factor as mudflats only develop on sheltered shorelines with gentle waves.

-   Tides are important as at high tide salt water covers the mudflats, whilst at low tide the surface is exposed to the atmosphere. Tides are important in shaping the character of the surface of mudflats as the generally smooth surface shows evidence of the flowing water carving or shaping the sediments.

-   A slow flowing river is also important. During high tide, sea water flows gently into the estuary carrying large amounts of fine sediments. This meets the equally slow flowing river with its own load of fine silts and clays. The interaction of these two flows is crucial. As they meet, the fine particles settle out of suspension by the process of flocculation.

•   Responses may conclude that it is a combination of factors that leads to the formation of mudflats in estuarine environments. Assessment may address connections between these factors. Although crucial, tides may be considered as just one of a number of important factors.

**Credit any other valid assessment**.

**AO1 = 4**

**AO2 = 5**

**[Total 9 marks]**

**Q4.**

Allow 1 mark per valid point with extra mark(s) for developed points (d).

**AO1**

•   A barrier beach is usually formed as an extension to a spit (1).

•   Longshore drift moves sediment along the coastline until there is a change in the coastline (1). A spit develops, usually in a bay and once the spit develops across the whole bay, a barrier beach forms (1). Barrier beaches are unlikely to form in estuaries as the outcoming force of freshwater will always keep part of the estuary clear (1).

•   Colonisation by vegetation can stabilise the barrier beach and trap further sediment keeping the barrier beach above sea even at high tide (1).

•   Depending upon the climate the landward side may be colonised by mangroves in the still lagoon, which adds further stability (1).

**AO1 = 4**

**[Total 4 marks]**

**Q5.**

**AO1** – Knowledge and understanding of the development of landforms of coastal deposition. Knowledge and understanding of how human activity affects the development of landforms of coastal deposition.

**AO2** – Application of knowledge and understanding to assess the extent to which human activity always has a negative impact on the development of landforms of coastal deposition.

Notes for answers

**AO1**

•   Systems in physical geography: systems concepts and their application to the development of coastal landscapes – inputs, outputs, energy, stores / components, flows / transfers, positive / negative feedback, dynamic equilibrium. The concepts of landform and landscape and how related landforms combine to form characteristic landscapes.

•   Origin and development of landforms and landscapes of coastal deposition. Beaches, simple and compound spits, tombolos, offshore bars, barrier beaches and islands and sand dunes; factors and processes in their development.

•   Recent and predicted climatic change and potential impact on coasts.

•   The relationship between process, time, landforms and landscapes in coastal settings.

•   Human intervention in coastal landscapes. Traditional approaches to coastal flood and erosion risk: hard and soft engineering. Sustainable approaches to coastal flood risk and coastal erosion management: shoreline management / integrated coastal zone management.

•   Geomorphological processes: weathering, mass movement, erosion, transportation and deposition. Distinctively coastal processes: marine: erosion – hydraulic action, wave quarrying, corrasion / abrasion, cavitation, solution, attrition; transportation: traction, suspension (longshore / littoral drift) and deposition; sub-aerial weathering, mass movement and runoff.

•   Case study(ies) of coastal environment(s) to illustrate and analyse fundamental coastal processes, their landscape outcomes and challenges in their sustainable management.

**AO2**

•   Candidates are free to argue in any direction in relation to the question. Some may remain neutral.

•   Some may argue that human activity has a significant impact on landforms of coastal deposition. The main argument may relate to the significant impact that coastal management can have upon landforms of coastal deposition. Two approaches could be taken, that either human activity encourages or enhances the development of landforms of coastal deposition (having a positive impact), or that it leads to the disruption or removal of landforms of coastal deposition (having a negative impact). Candidates may consider the impact of a range of management strategies relating to traditional approaches including various hard and soft engineering strategies, or more sustainable approaches relating to shoreline management / integrated coastal zone management. This may be supported with evidence of more localised impacts on specific named landforms, i.e. the impact of groynes on a particular beach and adjacent coastline. Assessment of whether these impacts are positive or negative will depend on the content presented.

•   Some responses may consider the impact of development and economic activity taking place on the coastline. This approach is valid as long as there is a clear link to how this activity is or is not having a negative impact on the development of landforms of coastal deposition.

•   Other responses may explore the current and future impact associated with the enhanced greenhouse effect due to anthropogenic emissions of greenhouse gases. Responses may consider the impact of rising sea levels and an increase in storm activity for example on landforms of coastal deposition. Again, assessment of the extent to which the impacts of this will always be negative will depend on the evidence presented.

•   Some responses may explore the idea of coasts as natural systems existing in a state of dynamic equilibrium. They may suggest that if human activity disrupts part of that system in one place, having a negative impact, e.g. it encourages the erosion of an existing landform of coastal deposition, that natural processes will seek to adjust by transporting the eroded materials and creating new landforms of coastal deposition elsewhere, thus establishing a new state of equilibrium, and having a positive impact here.

•   Responses are likely to be supported by specific examples to support the position taken, i.e. places where human activity has had a positive impact on the development of landforms of coastal deposition by encouraging their development, or where the impacts have been negative causing their destruction, as compared to other places where human activity has had little impact on the development of landforms of coastal deposition.

•   The key is that there is clear assessment of the extent to which human activity does or does not have negative impacts on the development of landforms of coastal deposition.

**Credit any other valid assessment**.

**Level 4 (16–20 marks)**

•   Detailed evaluative conclusion that is rational and firmly based on knowledge and understanding which is applied to the context of the question (AO2).

•   Detailed, coherent and relevant analysis and evaluation in the application of knowledge and understanding throughout (AO2).

•   Full evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Detailed, highly relevant and appropriate knowledge and understanding of place(s) and environments used throughout (AO1).

•   Full and accurate knowledge and understanding of key concepts and processes throughout (AO1).

•   Detailed awareness of scale and temporal change which is well-integrated where appropriate (AO1).

**Level 3 (11–15 marks)**

•   Clear evaluative conclusion that is based on knowledge and understanding which is applied to the context of the question (AO2).

•   Generally clear, coherent and relevant analysis and evaluation in the application of knowledge and understanding (AO2).

•   Generally clear evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Generally clear and relevant knowledge and understanding of place(s) and environments (AO1).

•   Generally clear and accurate knowledge and understanding of key concepts and processes (AO1).

•   Generally clear awareness of scale and temporal change which is integrated where appropriate (AO1).

**Level 2 (6–10 marks)**

•   Some sense of an evaluative conclusion partially based upon knowledge and understanding which is applied to the context of the question (AO2).

•   Some partially relevant analysis and evaluation in the application of knowledge and understanding (AO2).

•   Some evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Some relevant knowledge and understanding of place(s) and environments which is partially relevant (AO1).

•   Some knowledge and understanding of key concepts, processes and interactions and change (AO1).

•   Some awareness of scale and temporal change which is sometimes integrated where appropriate. There may be a few inaccuracies (AO1).

**Level 1 (1–5 marks)**

•   Very limited and / or unsupported evaluative conclusion that is loosely based upon knowledge and understanding which is applied to the context of the question (AO2).

•   Very limited analysis and evaluation in the application of knowledge and understanding. This lacks clarity and coherence (AO2).

•   Very limited and rarely logical evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Very limited relevant knowledge and understanding of place(s) and environments (AO1).

•   Isolated knowledge and understanding of key concepts and processes.

•   Very limited awareness of scale and temporal change which is rarely integrated where appropriate. There may be a number of inaccuracies (AO1).

**Level 0 (0 marks)**

Nothing worthy of credit.

**AO1 = 10**

**AO2 = 10**

**[Total 20 marks]**

**Q6.**

**AO1** – Knowledge and understanding of the processes related to the development dunes to include vegetation colonisation.

**AO2** – Application of this knowledge to the novel situation; specifically, in accounting for the formation of dunes and the role of vegetation in stabilising the dune.

Mark scheme

**Level 2 (4–6 marks)**

**AO1** – Demonstrates clear knowledge and understanding of concepts, processes, interactions and change.

**AO2** – Applies knowledge and understanding to the novel situation offering clear evaluation and analysis drawn appropriately from the context provided. Connections and relationships between different aspects of study are evident with clear relevance.

**Level 1 (1–3 marks)**

**AO1** – Demonstrates basic knowledge and understanding of concepts, processes, interactions, change.

**AO2** – Applies limited knowledge and understanding to the novel situation offering only basic evaluation and analysis drawn from the context provided. Connections and relationships between different aspects of study are basic with limited relevance.

Notes for answers

**AO1**

•   Origin and development of landforms and landscapes of coastal deposition – sand dunes; factors and processes in their development.

•   Distinctively coastal processes – transportation: traction, suspension and deposition.

**AO2**

•   The dunes have developed as a result of onshore winds and the processes of transportation.

•   Wind blows sand above the high-water mark by the processes of traction and saltation.

•   As evidenced by the question source, this appears to be a well-developed process having occurred over a period of many years. The vegetation is highly adapted to the environment, requiring few nutrients and limited water. Some may reference marram grass as the typical vegetation to first colonise these areas.

•   The grasses trap blowing sand and help to build up the dune. The dunes in the foreground are smaller and appear to be more recently colonised. The vegetation is more sparsely interspersed and appears to be largely one species.

•   The root systems bind the sand particles together giving a more rigid structure making the dunes less susceptible to further movement inland.

•   Some may go further to consider the idea of succession and how the vegetation in the background has much greater coverage and there may be some evidence of species diversity. These more mature dunes are much bigger in size (up to 100 metres above the shoreline). They are well protected by the vegetation which acts to stabilise the dunes.

•   It is possible to infer that basic soils are likely to be present as a result of succession, hence the increased coverage and biodiversity.

**Credit any other valid assessment.**

Generic explanation of the formation of dunes (with no attempt to apply knowledge to the resource and associated information) should be held to Level 1.

**AO1 = 2**

**AO2 = 4**

**[Total 6 marks]**

**Q7.**

**AO3** − Clear use of both **Figure 1** and **Figure 2** in analysing the changing nature of the coastal landforms and evidence provided. For full marks there must be use of both **Figure 1** and **2**.

**Level 2 (4−6 marks)**

Clear interpretation and analysis of the quantitative evidence provided, which makes appropriate use of data in support. Clear connection(s) between different aspects of the data and evidence.

**Level 1 (1−3 marks)**

Basic interpretation and evaluation of a geographical issue or question. Basic interpretation and assessment of the quantitative evidence provided, which makes limited use of the data in support. Basic connection(s) between different aspects of the data and evidence.

Notes for answers

•   The evidence suggests there have been significant changes to the coastal landforms.

•   Analysis of the data in the figures may include the following, but not exclusively:

•   The length and width of beach is different in all images. In 2005 there is only an approximately 2.5 km stretch of beach along the northwest coast, by 2009 beach extends along the entire coast north of the river, with a 3.5 km long beach that narrows as it extends south down the west coast, by 2013 a narrow beach extends along almost the entirety of the coast. Only a small stretch of the coast just south of the river mouth is without beach.

•   **Figure 2** shows that there is about a 6 fold increase in the area of beach between 2005 and 2013. **Figure 1** shows that there is an approximately 5 fold increase in the length of beach.

•   **Figure 1** and **Figure 2** show that there is no mud or tidal flat in 2005, but between 2009 and 2013 the area of mud flat increases 2.5 times and the area of tidal flat almost doubles. Therefore, the area of mud flat increases more than tidal flat, but the area of beach increases the most compared to both tidal and mud flats.

•   Responses could note significant changes evident between 2009 and 2013, a spit and associated mud and tidal flats, to the west of the river mouth, appear in 2009, but there is no evidence of these features in 2005. By 2013 the spit has completely disappeared, whilst the mud and tidal flats remain and have grown. **Figure 2** shows that in 2009 the spit covers the largest area, being almost twice as extensive as the area of beach.

•   Data may be used from **Figure 1** and **Figure 2** to support points made with regard to evidence given from the map as shown above in relation to the changing extent of the beach.

•   Some may explore the extent of changes illustrated by manipulation of the evidence provided.

**AO3 = 6**

**[Total 6 marks]**

**Q8.**

D

**AO1 = 1**

**[Total 1 mark]**

**Q9.**

Point marked

Allow 1 mark for each valid point with additional marks for developed points.

Notes for answers

•   Eustatic sea level change is a global change in sea level due to an actual fall or rise in the level of the sea (1) − mark for any clear definition.

•   When global temperatures fall, during a glacial period, more precipitation falls as snow and is stored on land as ice and snow (1). Water cycled from the sea to the land (via evaporation, condensation and precipitation) does not immediately return to the sea so global sea levels fall (1)(d).

•   Or the opposite. As global temperatures rise, during an interglacial or due to enhanced global warming, more precipitation falls as rain, and snow and ice melt. (1). Less water is stored on land and returns to the sea, so global sea levels rise (1)(d).

•   Some responses may refer to global sea levels rising due to the thermal expansion of sea water due to global temperatures rise due to the enhanced greenhouse effect (1).

•   Some responses may refer to changing global sea levels due to the changing geometry of ocean basins over geological timescales (1).

•   Allow max (1)(d) for support with data about levels / rates of sea level change over a given time.

**AO1 = 3**

**[Total 3 marks]**

**Q10.**

**AO1** − Knowledge and understanding of the landforms associated with submergence and emergence.

**AO2** − Application of this knowledge to the novel situation; specifically, in accounting for the formation of landforms of submergence where the coastline has retreated. Landforms of submergence may be considered where candidates may infer localised isostatic readjustment has occurred.

Mark scheme

**Level 2 (4−6 marks)**

**AO1** − Demonstrates clear knowledge and understanding of concepts, processes, interactions and change.

**AO2** − Applies knowledge and understanding to the novel situation offering clear evaluation and analysis drawn appropriately from the context provided. Connections and relationships between different aspects of study are evident with clear relevance.

**Level 1 (1−3 marks)**

**AO1** − Demonstrates basic knowledge and understanding of concepts, processes, interactions, change.

**AO2** − Applies limited knowledge and understanding to the novel situation offering only basic evaluation and analysis drawn from the context provided. Connections and relationships between different aspects of study are basic with limited relevance.

Notes for answers

**AO1**

•   Eustatic, isostatic and tectonic sea level change: major changes in sea level in the last 10,000 years.

•   Coastlines of emergence and submergence. Origin and development of associated landforms: raised beaches, marine platforms; rias, fjords, Dalmatian coasts.

•   Recent and predicted climatic change and potential impact on coasts.

•   The relationship between process, time, landforms and landscapes in coastal settings.

**AO2**

•   **Figure 1** shows that 20,000 years ago ice covered much of the north of Europe and northern Asia. It also affected the north of Britain and Ireland. Correspondingly sea levels appeared to be much lower creating large swathes of land (for instance across what is currently the North Sea), which no longer exist today. **Figure 2** shows that this land is now submerged. The land bridge connecting the UK to Ireland and mainland Europe has now been submerged.

•   This basic summary should then lead candidates to consider the landforms and landscapes associated with sea level change. Expect to see reference to drowned glacial troughs (Fjords) in northern Europe. Some description of process leading to formation is likely. Rias or drowned river valleys may also feature as well as dalmation coastlines.

•   More sophisticated responses may consider the localised isostatic readjustments which occurred following the end of the last glacial period. This should be accompanied with reference to raised beaches or marine platforms.

Generic explanation of the formation of landforms of emergence and submergence (with no attempt to apply knowledge to the map and associated information) should be held to **Level 1**.

**AO1 = 2, AO2 = 4**

**[Total 6 marks]**

**Q11.**

B

**AO1 = 1**

**[Total 1 mark]**

**Q14.**

**AO1** – Knowledge and understanding of a local scale coastal case study. Knowledge and understanding of the predicted impact of climate change.

**AO2** – Application of knowledge and understanding to assess the impact of climate change upon the chosen case study.

Notes for answers

**AO1**

•   Recent and predicted climatic change and potential impact on coasts.

•   Eustatic, isostatic and tectonic sea level change: major changes in sea level in the last 10 000 years.

•   Coastlines of emergence and submergence. Origin and development of associated landforms: raised beaches, marine platforms; rias, fjords, Dalmatian coasts.

•   Human intervention in coastal landscapes. Traditional approaches to coastal flood and erosion risk: hard and soft engineering. Sustainable approaches to coastal flood risk and coastal erosion management: shoreline management/integrated coastal zone management.

•   Case study(ies) of coastal environment(s) at a local scale to illustrate and analyse fundamental coastal processes, their landscape outcomes and engage with field data and challenges represented in their sustainable management.

**AO2**

•   Expect to see the impacts categorised into three main areas: the impact on likelihood of flooding, increased erosion and damage to local habitats. In the assessment some may consider attempts to mitigate the predicted impact of climate change through management. This is a valid approach.

•   E.g. The Norfolk coastal town of Great Yarmouth is around 30 km from Norwich, situated on the mouth of the River Yare. It provides access to the Norfolk Broads from the sea and one of its main industries is tourism (it has been a resort since 1760). More recently it has become an important servicing point for the offshore natural gas rigs. In the past Great Yarmouth was an important herring fishing port. Breydon Water and Halvergate Marshes, located at the rear of the town, are European-designated Special Protection Areas (SPA) and the North Denes area of the beach is home to a dune system, designated a Site of Special Scientific Interest (SSSI). Great Yarmouth (borough) has a population of approximately 93 400.

•   Existing evidence suggests the main climate risks as related to fluvial and coastal flooding. This is an ongoing issue as evidenced by the four flooding events in 2006, the North Sea flood of 1953 and a ‘near miss’ in November 2007 when a tidal surge and high tides resulted in limited flooding. Longer, wetter winters that are forecast to arise as a result of climate change also pose a risk to the town in light of the orientation of the local economy. There may also be the possibility of increasing heatwave events.

•   In terms of indirect effects of climate change, Great Yarmouth may suffer reputational damage due to media reports on flooding as well as its prolonged wet winters. This may cause considerable economic damage.

•   Halvergate Marshes is also under threat from sea level change.

•   The Local Authority have responded to these threats. One scheme is to lay an 877-metre long revetment of about 1,300 gabions – stone-filled and crushed concrete-filled cages – from the existing rock berm at Little Scratby Crescent, northwards across Scratby Beach to reach Newport.

•   The three-metre-high gabions are being positioned at the toe of the soft, sandy cliffs, protecting the low dunes, which are their natural buffer from lapping waves. If left unprotected, these dunes take some years to recover once hit in a storm, meaning they are less effective at reducing erosion to the cliffs if there is another storm soon after.

•   The added protection aims to delay the rate of erosion, giving the community time to adjust to coastal change, using the findings of the Government-funded Pathfinder Project, which identified the properties and areas at risk, and potential options, such as displacement land further back from the cliff which householders and businesses could relocate to.

•   The scheme is designed to help protect 35 homes which are nearest to the cliff edge, over a 25-year period, and there are another 100 homes, further back which are at risk over a 100-year period.

•   Any assessment is likely to consider the costs of such management. This scheme cost £600 000 for example.

Credit any other valid approach. Evaluation should be based upon preceding content.

**Level 4 (16–20 marks)**

•   Detailed evaluative conclusion that is rational and firmly based on knowledge and understanding which is applied to the context of the question. Interpretations are comprehensive, sound and coherent (AO2).

•   Detailed, coherent and relevant analysis and evaluation in the application of knowledge and understanding throughout (AO2).

•   Full evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Detailed, highly relevant and appropriate knowledge and understanding of place(s) and environments used throughout (AO1).

•   Full and accurate knowledge and understanding of key concepts, processes and interactions and change throughout (AO1).

•   Detailed awareness of scale and temporal change which is well integrated where appropriate (AO1).

**Level 3 (11–15 marks)**

•   Clear evaluative conclusion that is based on knowledge and understanding which is applied to the context of the question. Interpretations are generally clear and support the response in most aspects (AO2).

•   Generally clear, coherent and relevant analysis and evaluation in the application of knowledge and understanding (AO2).

•   Generally clear evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Generally clear and relevant knowledge and understanding of place(s) and environments (AO1).

•   Generally clear and accurate knowledge and understanding of key concepts, processes and interactions and change (AO1).

•   Generally clear awareness of scale and temporal change which is integrated where appropriate (AO1).

**Level 2 (6–10 marks)**

•   Some sense of an evaluative conclusion partially based upon knowledge and understanding which is applied to the context of the question (AO2). Interpretations are partial but do support the response in places.

•   Some partially relevant analysis and evaluation in the application of knowledge and understanding (AO2).

•   Some evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Some relevant knowledge and understanding of place(s) and environments which is partially relevant (AO1).

•   Some knowledge and understanding of key concepts, processes and interactions and change. There may be a few inaccuracies (AO1).

•   Some awareness of scale and temporal change which is sometimes integrated where appropriate. There may be a few inaccuracies (AO1).

**Level 1 (1–5 marks)**

•   Very limited and/or unsupported evaluative conclusion that is loosely based upon knowledge and understanding which is applied to the context of the question. Interpretation is basic (AO2).

•   Very limited analysis and evaluation in the application of knowledge and understanding. This lacks clarity and coherence (AO2).

•   Very limited and rarely logical evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Very limited relevant knowledge and understanding of place(s) and environments (AO1).

•   Isolated knowledge and understanding of key concepts, processes and interactions and change. There may be a number of inaccuracies. (AO1).

•   Very limited awareness of scale and temporal change which is rarely integrated where appropriate. There may be a number of inaccuracies (AO1).

**Level 0 (0 marks)**

•   Nothing worthy of credit.

**AO1 = 10, AO2 = 10**

**[Total 20 marks]**

**Q17.**

**AO1** – Knowledge and understanding of a coastal case study from beyond the UK. Knowledge and understanding of the role of human activity in shaping the landscape.

**AO2** – Application of knowledge and understanding to assess the impact of climate change upon the chosen case study.

Notes for answers

**AO1**

•   Case study of a contrasting coastal landscape beyond the UK to illustrate and analyse how it presents risks and opportunities for human occupation and development and evaluate human responses of resilience, mitigation and adaptation.

•   Human intervention in coastal landscapes. Traditional approaches to coastal flood and erosion risk: hard and soft engineering. Sustainable approaches to coastal flood risk and coastal erosion management: shoreline management/integrated coastal zone management.

•   Recent and predicted climatic change and potential impact on coasts.

**AO2**

•   Expect many responses to consider coastal management as part of the intervention in shaping coastlines. Case studies are likely to focus on The Sundarbans and / or Odisha though others may feature.

•   Bangladesh lies, in large part on the Ganges Delta. This low-lying land is highly susceptible to flooding and erosion. Sea level change is a serious threat to the viability of coastal Bangladesh. Without concerted, integrated and consistent action, Bangladesh’s existence would be under serious threat.

•   Expect to see reference to Integrated Coastal Zone Management (ICZM). This is a holistic approach which brings together all stakeholders. It sees the whole coastline as one unit rather than the more dated approach which historically failed to see that actions in one part of the coast could have devastating impacts elsewhere.

•   Bangladesh has the combined issues of land subsidence, sea level rise and a growing population occupying ever more marginal land.

•   The Bengali people have years of experience of adapting to changing environmental conditions caused by shifting river channels, land creation and erosion, and the impacts of floods, cyclones and storm surges. The country’s government, too, has long experience of managing change, including measures to cope with natural disasters. Bangladesh is not helpless, therefore, against coping with sea-level rise. A number of interventions are being used to counter foreseen impacts of sea-level rise during the 21st century.

•   The country aims to maintain freshwater flow to western parts of the Ganges Tidal Floodplain in order to prevent the salt-water front from moving further inland. The most direct method has been to divert additional water from the Ganges River down the Gorai-Madhumati River by means of a barrage across the Ganges in Bangladesh.

•   Embankments have been raised and strengthened as sea-level rises.

•   Bangladesh has been experimenting with raised mounds or banks on which to grow crops. This adaptation is designed to retain farmland in the event of a saltwater ingress.

•   In the Meghna estuary, land reclamation is providing new land for cultivation and providing fresh water for domestic use.

•   In rural areas, work has been undertaken to raise house plinth levels above the highest predicted storm-surge levels and increase cyclone shelter capacity as population grows.

•   For Chittagong and Cox’s Bazar, the two major coastal cities most exposed to sea-level rise and to storm surges, the creation of artificial raised land using material from nearby hills is being investigated.

•   In the longer term, too, investigate the practicality of constructing barriers across river mouths in the south-west to prevent salt-water intrusion, as in The Netherlands.

•   Assessment is likely to consider cost benefit as well as effectiveness of such strategies. Any assessment is permissible provided it is based upon preceding content.

Credit any other valid approach. Evaluation should be based upon preceding content.

**Level 4 (16–20 marks)**

•   Detailed evaluative conclusion that is rational and firmly based on knowledge and understanding which is applied to the context of the question. Interpretations are comprehensive, sound and coherent (AO2).

•   Detailed, coherent and relevant analysis and evaluation in the application of knowledge and understanding throughout (AO2).

•   Full evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Detailed, highly relevant and appropriate knowledge and understanding of place(s) and environments used throughout (AO1).

•   Full and accurate knowledge and understanding of key concepts, processes and interactions and change throughout (AO1).

•   Detailed awareness of scale and temporal change which is well integrated where appropriate (AO1).

**Level 3 (11–15 marks)**

•   Clear evaluative conclusion that is based on knowledge and understanding which is applied to the context of the question. Interpretations are generally clear and support the response in most aspects (AO2).

•   Generally clear, coherent and relevant analysis and evaluation in the application of knowledge and understanding (AO2).

•   Generally clear evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Generally clear and relevant knowledge and understanding of place(s) and environments (AO1).

•   Generally clear and accurate knowledge and understanding of key concepts, processes and interactions and change (AO1).

•   Generally clear awareness of scale and temporal change which is integrated where appropriate (AO1).

**Level 2 (6–10 marks)**

•   Some sense of an evaluative conclusion partially based upon knowledge and understanding which is applied to the context of the question (AO2). Interpretations are partial but do support the response in places.

•   Some partially relevant analysis and evaluation in the application of knowledge and understanding (AO2).

•   Some evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Some relevant knowledge and understanding of place(s) and environments which is partially relevant (AO1).

•   Some knowledge and understanding of key concepts, processes and interactions and change. There may be a few inaccuracies (AO1).

•   Some awareness of scale and temporal change which is sometimes integrated where appropriate. There may be a few inaccuracies (AO1).

**Level 1 (1–5 marks)**

•   Very limited and/or unsupported evaluative conclusion that is loosely based upon knowledge and understanding which is applied to the context of the question. Interpretation is basic (AO2).

•   Very limited analysis and evaluation in the application of knowledge and understanding. This lacks clarity and coherence (AO2).

•   Very limited and rarely logical evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Very limited relevant knowledge and understanding of place(s) and environments (AO1).

•   Isolated knowledge and understanding of key concepts, processes and interactions and change. There may be a number of inaccuracies (AO1).

•   Very limited awareness of scale and temporal change which is rarely integrated where appropriate. There may be a number of inaccuracies (AO1).

**Level 0 (0 marks)**

•   Nothing worthy of credit.

**AO1 = 10, AO2 = 10**

**[Total 20 marks]**

**Q18.**

Point marked

Allow 1 mark per valid point with extra mark(s) for developed points (d).

For example:

Notes for answers

•   Fjords are an example of coastal landforms of submergence (1). They are primarily a product of glacial erosion (1). As glaciers advanced towards coastal locations in Norway for example, they carved out vast glacial troughs (1), through processes such as abrasion and plucking (1) (d). A combination of localised isostatic re-adjustment and global eustatic sea level change has led to the flooding of these valleys (1). The valleys have fairly consistent depths though are often shallower near the mouth (1). This is due to the reduced impact of erosion by ice as the glacier met sea water during the glacial advance (1) (d). An example of Sogne Fjord in Norway (1).

The notes for answers are not exhaustive. Credit any valid points.

**AO1 = 4**

**[Total 4 marks]**

**Q19.**

**AO1** − Demonstrates knowledge and understanding of sources of coastal energy. Knowledge and understanding of coastal landscape development.

**AO2** − Application of knowledge and understanding to analyse and evaluate how the energy available from different sources has a direct impact upon the emerging landscape.

Mark scheme

**Level 3 (7−9 marks)**

**AO1** − Demonstrates detailed knowledge and understanding of concepts, processes, interactions and change. These underpin the response throughout.

**AO2** − Applies knowledge and understanding appropriately with detail. Connections and relationships between different aspects of study are fully developed with complete relevance. Analysis and evaluation are detailed and well supported with appropriate evidence.

**Level 2 (4−6 marks)**

**AO1** − Demonstrates clear knowledge and understanding of concepts, processes, interactions and change. These are mostly relevant though there may be some minor inaccuracy.

**AO2** − Applies clear knowledge and understanding appropriately. Connections and relationships between different aspects of study are evident with some relevance. Analysis and evaluation are evident and supported with clear and appropriate evidence.

**Level 1 (1−3 marks)**

**AO1** − Demonstrates basic knowledge and understanding of concepts, processes, interactions and change. This offers limited relevance with inaccuracy.

**AO2** − Applies limited knowledge and understanding. Connections and relationships between different aspects of study are basic with limited relevance. Analysis and evaluation are basic and supported with limited appropriate evidence.

Notes for answers

**AO1**

•   Sources of energy in coastal environments: winds, waves (constructive and destructive), currents and tides. Low energy and high energy coasts.

•   Systems in physical geography: systems concepts and their application to the development of coastal landscapes − inputs, outputs, energy, stores / components, flows / transfers, positive / negative feedback, dynamic equilibrium. The concepts of landform and landscape and how related landforms combine to form characteristic landscapes.

•   Geomorphological processes: weathering, mass movement, erosion, transportation and deposition.

•   Origin and development of landforms and landscapes of coastal erosion: cliffs and wave cut platforms, cliff profile features including caves, arches and stacks; factors and processes in their development.

•   Origin and development of landforms and landscapes of coastal deposition. Beaches, simple and compound spits, tombolos, offshore bars, barrier beaches and islands and sand dunes; factors and processes in their development.

•   Named low and high energy coastlines are likely to support responses.

**AO2**

•   Evaluation − For energy, responses will most likely refer to wind, waves, currents and tides and how these shape the coastline. The key is that responses assess the importance of the energy in the development of the coastal landscape of choice.

•   Analysis − High energy environments are characterised by strong winds and a large fetch, which generate strong currents and more destructive waves. These waves attack exposed coastlines, usually cliff lined, where the water is deep and the waves can attack unimpeded by shallow water. Expect to see reference to geos, arches, caves, stacks and stumps as characteristic landforms created in these environments. The assessment here should really note the importance of wind in this regard which in turn affects wave power.

•   Analysis − Some responses may assess the importance of constructive versus destructive waves and link this to the development of associated coastal landscapes. As long as the focus is on the importance of the energy source in the development of the landscape, this is a valid approach.

•   Analysis − Others may consider the direction of the prevailing wind in assessing importance of sources of energy. Provided other conditions exist at the coastline (such as shallow water and a sediment supply), this may be linked to the development of beaches and spits. Again the wind is the critical factor in the development of this landscape. These low energy environments are characterised by low wind speeds or calm conditions in sheltered environments. Waters tend to be shallow and constructive waves dominate. The swash is more powerful than backwash and sediments are pushed up the beaches in bays. Expect to see reference to beaches and bays. Some may link this to longshore drift and the formation of spits where local factors allow the formation of such features.

•   Analysis − Tides may also feature as an important energy supply. Responses may consider estuaries and the development of mud flats and salt marshes. Tides may also be linked to prevailing weather conditions and where low pressure and high tides coincide storm surges may cause significant erosion including cliff collapse. This line of reasoning would constitute a more sophisticated response.

•   Overall evaluation − as long as there is some clear direction provided from preceding content, assessment may consider any energy source as important. Wind should be a strong feature as this is the major driver.

**AO1 = 4, AO2 = 5**

**[Total 9 marks]**

**Q20.**

**AO1** − Knowledge and understanding of the process of mass movement, its causes and associated landforms.

**AO2** − Application of this knowledge to the novel situation; specifically the aspects of rotational slumping and sliding. Clearly links the process to the development of the landscapes.

Mark scheme

**Level 2 (4−6 marks)**

**AO1** − Demonstrates clear knowledge and understanding of concepts, processes, interactions and change.

**AO2** − Applies knowledge and understanding to the novel situation offering clear analysis and evaluation drawn appropriately from the context provided. Connections and relationships between different aspects of study are evident with clear relevance.

**Level 1 (1−3 marks)**

**AO1** − Demonstrates basic knowledge and understanding of concepts, processes, interactions, change.

**AO2** − Applies limited knowledge and understanding to the novel situation offering basic analysis and evaluation drawn from the context provided. Connections and relationships between different aspects of study are basic with limited relevance.

Notes for answers

**AO1**

•   The geomorphological process of mass movement to include sliding and slumping.

•   Landforms / landscapes associated with mass movement.

•   Origin and development of landforms and landscapes of coastal deposition.

**AO2**

•   Analysis and evaluation of the novel situation; specifically the aspects of rotational slumping and sliding. Clearly links the process to the development of this landscape.

•   Expect responses to examine the factors which may have led to mass movement. Whilst definitions are not required some will provide these. The key is the link between the mass movement process and the associated landscape. Some may consider the role of mass movement in modifying the shape and appearance of cliffs or other features such as the beach.

•   Consideration of rotational slumping or sliding which is an aspect of mass movement and again changes the shape of the cliff line by reducing the cliff angle.

•   Factors combine to cause the mass movement; most notably the unconsolidated materials (glacially deposited materials) which form the basis of a coastline experiencing such change; and the prevailing weather or climatic conditions which often leave the soil saturated causing the slump or slide to occur, mainly due to the lack of friction or resistance to collapse.

**AO1 = 2, AO2 = 4**

**[Total 6 marks]**

**Q21.**

**AO1** − Demonstrates knowledge and understanding of sources coastal energy. Knowledge and understanding of coastal landscape development.

**AO2** − Application of knowledge and understanding to analyse and evaluate the role of wind in relation to other factors affecting coastal energy.

Mark scheme

**Level 3 (7−9 marks)**

**AO1** − Demonstrates detailed knowledge and understanding of concepts, processes, interactions and change. These underpin the response throughout.

**AO2** − Applies knowledge and understanding appropriately with detail. Connections and relationships between different aspects of study are fully developed with complete relevance. Analysis and evaluation is detailed and well supported with appropriate evidence.

**Level 2 (4−6 marks)**

**AO1** − Demonstrates clear knowledge and understanding of concepts, processes, interactions and change. These are mostly relevant though there may be some minor inaccuracy.

**AO2** − Applies clear knowledge and understanding appropriately. Connections and relationships between different aspects of study are evident with some relevance. Analysis and evaluation is evident and supported with clear and appropriate evidence.

**Level 1 (1−3 marks)**

**AO1** − Demonstrates basic knowledge and understanding of concepts, processes, interactions and change. This offers limited relevance with inaccuracy.

**AO2** − Applies limited knowledge and understanding. Connections and relationships between different aspects of study are basic with limited relevance. Analysis and evaluation is basic and supported with limited appropriate evidence.

Notes for answers

**AO1**

•   Sources of energy in coastal environments: winds, waves (constructive and destructive), currents and tides. Low energy and high energy coasts.

•   Systems in physical geography: systems concepts and their application to the development of coastal landscapes − inputs, outputs, energy, stores / components, flows / transfers, positive / negative feedback, dynamic equilibrium.

•   Geomorphological processes: weathering, mass movement, erosion, transportation and deposition.

•   Named low and high energy coastlines are likely to support responses.

**AO2**

•   Wind should be considered as a key factor is determining the impact of coastal energy. Where the distance of open water over which the wind travels is great, then larger, more destructive waves are created. This is synonymous with high energy environments.

•   Wind should be considered along with other factors. Some may consider the combined effects of storms and high tides, which when combined with the spring high tide have the potential to create storm surges. Others may consider tropical storms in this regard.

•   Local coastal geomorphology also has a part to play in determining the impact of energy. Some may consider bays, headlands and wave refraction. Coastline with deep water is more likely to be high energy as there no frictional drag exerted by the sea bed and there is nothing to dissipate wave energy. Wave refraction means that the full force of the waves is directed upon the headland. Bays and beaches have the opposite effect. The shallow water dissipates wave energy. Estuaries tend to be lower energy environments but can also be affected by waves such as the Severn Bore. This is formed in very particular tidal conditions and only occurs where there are very particular geomorphological characteristics.

•   Others may consider currents as a factor affecting coastal energy. Depending upon the direction of the current and the angle at which waves strike the coast can also determine whether longshore drift occurs and sediments move along the coast. This itself is connected to wind and that link should be made.

•   Responses may conclude that it is the interaction of different factors which determines the impact of coastal energy rather than any single factor. Others may conclude in favour of wind as the most significant factor. Any approach is valid provided it is coherently argued.

**AO1 = 4, AO2 = 5**

**[Total 9 marks]**

**Q22.**

**AO1** Knowledge and understanding of subaerial weathering processes. Knowledge and understanding of the development of landscapes of coastal erosion.

**AO2** Application of knowledge and understanding to assess the extent to which subaerial weathering processes contribute to the development of landscapes of coastal erosion.

Notes for answers

**AO1**

•   Geomorphological processes: weathering, mass movement, erosion, transportation and deposition.

•   Distinctively coastal processes: marine: erosion – hydraulic action, wave quarrying, corrasion/abrasion, cavitation, solution, attrition; transportation: traction, suspension (longshore/littoral drift) and deposition; sub-aerial weathering, mass movement and runoff.

•   The relationship between process, time, landforms and landscapes in coastal settings.

•   Origin and development of landforms and landscapes of coastal deposition. Beaches, simple and compound spits, tombolos, offshore bars, barrier beaches and islands and sand dunes; factors and processes in their development.

•   Origin and development of landforms and landscapes of coastal erosion: cliffs and wave cut platforms, cliff profile features including caves, arches and stacks; factors and processes in their development.

•   Systems in physical geography: systems concepts and their application to the development of coastal landscapes – inputs, outputs, energy, stores/components, flows/transfers, positive/negative feedback, dynamic equilibrium. The concepts of landform and landscape and how related landforms combine to form characteristic landscapes.

•   Case study(ies) of coastal environment(s) at a local scale to illustrate and analyse fundamental coastal processes, their landscape outcomes as set out above and engage with field data and challenges represented in their sustainable management.

**AO2**

•   It is likely that many responses will reach the view that weathering processes do indeed make little contribution to the development of landscapes of coastal erosion. However, some responses could reach the opposite conclusion and come to the view that weathering plays a significant role in the development of landscapes of coastal erosion.

•   Responses may come to the view that the extent of the contribution that weathering processes make to the development of landscapes of coastal erosion is dependent on a range of other factors.

•   Other factors that the contribution of weathering processes may be assessed against could include factors such as: processes of erosion, processes of deposition, the geology of the coast, the impact of wave action, the climate of the coastal area.

•   It is likely that the contribution of weathering processes may be assessed in the context of specific landscape features, for example: In the context of a section of coastal landscape composed of a sequence of erosional landforms including a cave, arch and stack, may conclude that weathering plays a significant role by working in tandem with processes of erosion. Where processes of chemical weathering, physical and biological weathering may weaken the rock and thus allow erosion to proceed more easily.

•   Equally some responses may come to the view that weathering processes make little contribution to the development of landscapes of coastal erosion with illustrated support. Some responses may suggest that subaerial processes operate above the influence of waves, and thus erosional processes, so landscape features that are formed below the high watermark may mainly be developed by wave action.

The key is that there is clear assessment of the extent to which the candidate believes that weathering processes make little contribution to the development of landscapes of coastal erosion. A clear view is expected.

Credit any other valid assessment.

**AO1 = 4, AO2 = 5**

**[Total 9 marks]**

**Q23.**

**AO1** – Knowledge and understanding of the processes related to the development of spits.

**AO2** – Application of this knowledge to the novel situation; specifically, in accounting for relative importance of factors leading to the development of spits.

Mark scheme

**Level 2 (4–6 marks)**

**AO1** – Demonstrates clear knowledge and understanding of concepts, processes, interactions and change.

**AO2** – Applies knowledge and understanding to the novel situation offering clear evaluation and analysis drawn appropriately from the context provided. Connections and relationships between different aspects of study are evident with clear relevance.

**Level 1 (1–3 marks)**

**AO1** – Demonstrates basic knowledge and understanding of concepts, processes, interactions, change.

**AO2** – Applies limited knowledge and understanding to the novel situation offering only basic evaluation and analysis drawn from the context provided. Connections and relationships between different aspects of study are basic with limited relevance.

Notes for answers

**AO1**

•   Systems in physical geography: systems concepts and their application to the development of desert landscapes – inputs, outputs, energy, stores/components, flows/transfers, positive/negative feedback, dynamic equilibrium.

•   Origin and development of landforms and landscapes of coastal deposition. Beaches, simple and compound spits.

•   Estuarine mudflat/saltmarsh environments and associated landscapes; factors and processes in their development.

•   Geomorphological processes: weathering, erosion, transportation and deposition.

•   Distinctively coastal processes: marine: transportation: traction, suspension (longshore/littoral drift) and deposition;

**AO2**

•   Several factors lead to the development of spits such as the one shown in the photograph, Spurn Head spit.

•   There has to be already supply of sediment, in this case provided by the boulder clay of the Holderness coastline. Longshore drift works in conjunction with a changing direction of coastline to continue to push sediment into the Humber estuary.

•   The recurved head has been formed as a result of wave refraction.

•   The area behind the spit appears to be shallow water and some may argue that this is an inter-tidal mudflat, sheltered from the sea’s most powerful energy by the spit itself.

•   In terms of relative importance, it is more a combination of factors which come together to create this landscape, though the supply of sediment and longshore drift might feature as being most important.

Credit any other valid assessment.

Generic explanation of the formation of spits (with no attempt to apply knowledge to the resource and associated information) should be held to Level 1.

**AO1 = 2, AO2 = 4**

**[Total 6 marks]**

**Q24.**

**AO1** − Knowledge and understanding of the processes associated with weathering and erosion. Knowledge and understanding of the role of these processes in landscape development.

**AO2** − Application of knowledge and understanding to assess the relative importance of these processes in different contexts; specifically in relation to landscape development.

Notes for answers

**AO1**

•   Sources of energy in coastal environments: winds, waves (constructive and destructive), currents and tides. Low energy and high energy coasts.

•   Sediment sources, cells and budgets.

•   Geomorphological processes: weathering, mass movement, erosion, transportation and deposition.

•   Distinctively coastal processes: marine: erosion – hydraulic action, wave quarrying, corrasion / abrasion, cavitation, solution, attrition; transportation: traction, suspension (longshore / littoral drift) and deposition; sub-aerial weathering, mass movement and runoff.

•   Origin and development of landforms and landscapes of coastal erosion: cliffs and wave cut platforms, cliff profile features including caves, arches and stacks; factors and processes in their development.

•   Case studies of coastal environments at a local scale to illustrate and analyse fundamental coastal processes and their landscape outcomes.

**AO2**

•   Weathering and associated mass movement is particularly important in explaining the development of a number of coastal locations in the UK and abroad. The decisive factor in determining the extent to which mass movement is a dominant process is often the local geology and other physical geographical conditions. There are many different types of mass movement arising out of weathering processes and erosion. These processes vary depending upon location. Many will consider rotational slumping and / or sliding. Here the rock type is a decision factor.

•   In 1999, Vargas Sate in Venezuela experienced a coastal mud slide. This was as a direct result of prevailing weather conditions and local geology. Heavy rains fell in December 1999 along the north-central coast of Venezuela. Runoff entered channels and rushed towards the sea, picking up sediments along its course. These rains triggered shallow landslides which stripped soil and rock off the landscape and sent them slipping down the steep slopes towards the sea. The additional water liquefied these landslides into debris flows. Over 10,000 people are known to have died in this single event. This evidence suggests that weathering and associated mass movements act entirely independently of coastal processes.

•   Others may refer to the process of soil creep which again acts independently of any coastal processes and is more likely created by gravity moving soils and sediments downslope with moisture provided as a lubricant.

•   At Barton on Sea, there is an example of erosion and weathering working together in the process of cliff collapse. The cliffs are composed of gravels, sands and clays. This means that they are easily eroded and have little strength to resist collapse. The gravels and sands, being permeable created a slip plane. They absorbed rainwater, whereas the clay is impermeable. This combined with the undercutting caused a rotational slump and cliff collapse.

•   Similarly, at Beachy Head in 1999 a huge landslide occurred. This was a product of the combined impact of weathering processes operating sub aerially and coastal erosion caused by strong waves pounding the base of the cliff causing undercutting and vibrations.

•   For coastlines of erosion expect to see reference to places such as the south coast of the UK and the concordant and discordant geology found the Purbeck region. Here there is a combination of high energy, powerful waves with a large fetch. There is a lack of coastal defence and beaches / shallow water to protect the coastline. As a result, erosion dominates the landscape development in this area. However even here weathering is also shaping the landscape. Old Harry stack is experiencing subaerial weathering and will eventually fall into the sea as a result of this process and the continued undercutting of the stack.

•   The concept of landscape should emerge in responses. Reference to individual landforms rather than the assembly of landforms associated with landscape development is likely to be a feature of a lower end response.

Whatever the approach there should be some acknowledgements that along most coastlines, both types of process are acting upon the coastline to shape and develop the landscape features.

There should also be some assessment of relative importance.

**Level 4 (16−20 marks)**

•   Detailed evaluative conclusion that is rational and firmly based on knowledge and understanding which is applied to the context of the question. Interpretations are comprehensive, sound and coherent (AO2).

•   Detailed, coherent and relevant analysis and evaluation in the application of knowledge and understanding throughout (AO2).

•   Full evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Detailed, highly relevant and appropriate knowledge and understanding of place(s) and environments used throughout (AO1).

•   Full and accurate knowledge and understanding of key concepts, processes and interactions and change throughout (AO1).

**Level 3 (11−15 marks)**

•   Clear evaluative conclusion that is based on knowledge and understanding which is applied to the context of the question. Interpretations are generally clear and support the response in most aspects (AO2).

•   Generally clear, coherent and relevant analysis and evaluation in the application of knowledge and understanding (AO2).

•   Generally clear evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Generally clear and relevant knowledge and understanding of place(s) and environments (AO1).

•   Generally clear and accurate knowledge and understanding of key concepts, processes and interactions and change (AO1).

**Level 2 (6−10 marks)**

•   Some sense of an evaluative conclusion partially based upon knowledge and understanding which is applied to the context of the question (AO2). Interpretations are partial but do support the response in places.

•   Some partially relevant analysis and evaluation in the application of knowledge and understanding (AO2).

•   Some evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Some relevant knowledge and understanding of place(s) and environments which is partially relevant (AO1).

•   Some knowledge and understanding of key concepts, processes and interactions and change. There may be a few inaccuracies (AO1).

**Level 1 (1−5 marks)**

•   Very limited and / or unsupported evaluative conclusion that is loosely based upon knowledge and understanding which is applied to the context of the question (AO2). Interpretation is basic.

•   Very limited analysis and evaluation in the application of knowledge and understanding. This lacks clarity and coherence (AO2).

•   Very limited and rarely logical evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Very limited relevant knowledge and understanding of place(s) and environments (AO1).

•   Isolated knowledge and understanding of key concepts, processes and interactions and change. There may be a number of inaccuracies (AO1).

**Level 0 (0 marks)**

•   Nothing worthy of credit.

**AO1 = 10, AO2 = 10**

**[Total 20 marks]**

**Q25.**

**AO3** – Analysis of the map evidence to identify patterns, anomalies and using data manipulation to support response.

Mark scheme

**Level 2 (4–6 marks)**

**AO3** – Clear analysis of the quantitative evidence provided, which makes appropriate use of evidence in support. Clear connection(s) between different aspects of the evidence.

**Level 1 (1–3 marks)**

**AO3** – Basic analysis of the quantitative evidence provided, which makes limited use of evidence in support. Basic connection(s) between different aspects of the evidence.

Notes for answers

**AO3**

•   The overall picture is very mixed across the European coastlines.

•   There are large areas experiencing accretion, particularly around northern Europe.

•   The picture around the Jutland peninsula is hard to decipher and somewhat unclear. Expect candidates to question the clarity of the resource in this area. The picture is mixed here with what looks like more accretion than erosion.

•   Some may suggest that more exposed coastlines are eroding, but this pattern is far from certain. There is some evidence in support in places such as the west coast of Ireland and Portugal.

•   The Mediterranean coastlines are almost all either eroding or stable with only small pockets of accretion such as in northern Italy.

•   It is interesting to note that the islands of Madeira and the Canaries are both exposed coastlines but experiencing stability.

Credit any other valid analysis.

**AO3 = 6**

**[Total 6 marks]**

**Q26.**

**AO1** – Knowledge and understanding of systems operating in coastal landscapes. Awareness of coastal management strategies.

**AO2** – Application of knowledge and understanding to assess the extent to understanding of feedback systems can be utilised in helping to combat erosion flooding as well as to protect habitats.

Notes for answers

**AO1**

•   Systems in physical geography: systems concepts and their application to the development of coastal landscapes – inputs, outputs, energy, stores/components, flows/transfers, positive/negative feedback, dynamic equilibrium. The concepts of landform and landscape and how related landforms combine to form characteristic landscapes.

•   Human intervention in coastal landscapes. Traditional approaches to coastal flood and erosion risk: hard and soft engineering. Sustainable approaches to coastal flood risk and coastal erosion management: shoreline management/integrated coastal zone management.

•   Case study(ies) of coastal environment(s) at a local scale to illustrate and analyse fundamental coastal processes and challenges represented in their sustainable management.

•   Case study of a contrasting coastal landscape beyond the UK to illustrate and analyse how it presents risks and opportunities for human occupation and development and evaluate human responses of resilience, mitigation and adaptation.

**AO2**

•   Expect to see responses set out a clear understanding of the concept of positive and negative feedback in coastal systems.

•   At the coastline there are many examples of both positive and negative feedback. The coastal management philosophy aims to respond to change in the system by aiming to restore natural balance at the coastline. Coastal management therefore seeks to exploit the concept and application of naturally occurring negative feedback in the coastal system. Management also seeks to counteract the exacerbating and damaging impact of positive feedback which takes the system further and further away from equilibrium.

•   Expect to see a combination of place based case studies and / or exemplification through evaluation of shoreline management / integrated coastal zone management plans.

•   For example, Holderness is already one of the fastest eroding coastlines in the world, receding by up to 2 metres per year. Sea level change threatens to further exacerbate this by creating a positive feedback loop. As sea levels are predicted to rise this will further erode coastlines. This combined with naturally occurring processes such as longshore drift will expose the coastline to even further erosion. Without intervention stability will only be created when the boulder clay has been removed completely, with more resistant chalk lying further inland. Clearly this would be intolerable to local communities but also economically. As a result, substantial coastal management has been employed to restore equilibrium eg by installing sea walls, rip rap and groynes to resist erosion and create artificial beaches.

•   In terms of integrated coastal zone management schemes, the key underpinning philosophy is one of bringing all relevant stakeholders together to consider a sustainable future for the coastal which responds to change, always seeking to restore balance. One example is the Pegaso Project, an Integrated coastal management strategy in the Mediterranean. Reports have highlighted numerous examples of entire coastlines that have experienced exceptionally high waves, severe floods, or large shoreline erosions among other natural coastal impacts, all examples of potential positive feedback. Floods for example, accounted for 35% of all natural disasters that hit the Mediterranean. Italy and Romania are among the countries that had experienced an increasing number of severe floods. Besides the possible effects of climate change, growing uncontrolled coastal urbanisation, and construction of coastal infrastructures, land use changes and deforestation are the main reasons creating higher sensitivity on the part of coastal zones to these events. The purpose of the ICZM in this context is to address the underlying positive feedback and return the coast to a more stable equilibrium in a sustainable fashion for all stakeholders.

•   In summary, whatever the context, expect most responses to agree that understanding feedback is essential to sustainable coastal management.

Credit any other valid approach. Evaluation should be based upon preceding content.

**Level 4 (16–20 marks)**

•   Detailed evaluative conclusion that is rational and firmly based on knowledge and understanding which is applied to the context of the question. Interpretations are comprehensive, sound and coherent (AO2).

•   Detailed, coherent and relevant analysis and evaluation in the application of knowledge and understanding throughout (AO2).

•   Full evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Detailed, highly relevant and appropriate knowledge and understanding of place(s) and environments used throughout (AO1).

•   Full and accurate knowledge and understanding of key concepts, processes and interactions and change throughout (AO1).

•   Detailed awareness of scale and temporal change which is well integrated where appropriate (AO1).

**Level 3 (11–15 marks)**

•   Clear evaluative conclusion that is based on knowledge and understanding which is applied to the context of the question. Interpretations are generally clear and support the response in most aspects (AO2).

•   Generally clear, coherent and relevant analysis and evaluation in the application of knowledge and understanding (AO2).

•   Generally clear evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Generally clear and relevant knowledge and understanding of place(s) and environments (AO1).

•   Generally clear and accurate knowledge and understanding of key concepts, processes and interactions and change (AO1).

•   Generally clear awareness of scale and temporal change which is integrated where appropriate (AO1).

**Level 2 (6–10 marks)**

•   Some sense of an evaluative conclusion partially based upon knowledge and understanding which is applied to the context of the question (AO2). Interpretations are partial but do support the response in places.

•   Some partially relevant analysis and evaluation in the application of knowledge and understanding (AO2).

•   Some evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Some relevant knowledge and understanding of place(s) and environments which is partially relevant (AO1).

•   Some knowledge and understanding of key concepts, processes and interactions and change. There may be a few inaccuracies (AO1).

•   Some awareness of scale and temporal change which is sometimes integrated where appropriate. There may be a few inaccuracies (AO1).

**Level 1 (1–5 marks)**

•   Very limited and/or unsupported evaluative conclusion that is loosely based upon knowledge and understanding which is applied to the context of the question. Interpretation is basic (AO2).

•   Very limited analysis and evaluation in the application of knowledge and understanding. This lacks clarity and coherence (AO2).

•   Very limited and rarely logical evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Very limited relevant knowledge and understanding of place(s) and environments (AO1).

•   Isolated knowledge and understanding of key concepts, processes and interactions and change. There may be a number of inaccuracies. (AO1).

•   Very limited awareness of scale and temporal change which is rarely integrated where appropriate. There may be a number of inaccuracies (AO1).

**Level 0 (0 marks)**

•   Nothing worthy of credit.

**AO1 = 10, AO2 = 10**

**[Total 20 marks]**

**Q27.**

D

**AO1 = 1**

**[Total 1 mark]**

**Q28.**

**AO3** – Analysis of the map evidence to identify patterns, anomalies and using data manipulation to support response.

**Level 2 (4–6 marks)**

**AO3** – Clear analysis of the quantitative evidence provided, which makes appropriate use of evidence in support. Clear connection(s) between different aspects of the evidence.

**Level 1 (1–3 marks)**

**AO3** – Basic analysis of the quantitative evidence provided, which makes limited use of evidence in support. Basic connection(s) between different aspects of the evidence.

Notes for answers

**AO3**

•   There appears to be some correlation between the 2010 melting day anomaly and uplift.

•   In places where melting is higher than the 1979–2009 average, there has been more uplift in 2010. Reference to isostatic rebound may feature and, as this is implied by the key, it is accepted.

•   In the southwest, the melt anomaly is at its strongest, with a large north-south swathe of ice experiencing more than 60 days above average melting. In senu for example, this coincides with around 20 mm of uplift.

•   The pattern is by no means consistent though. At grok for example there is a relatively small variation from the 1979–2009 average (+20 days), but this also has around 9–10 mm of uplift. Similarly at kely, this area (to the east) experiences the highest concentration of melt anomaly but only around 5–6 mm of uplift.

•   The uplift is all coastal according to the data, with neither melting nor uplift taking place inland.

•   The south of the island is generally experiencing more uplift than the north.

Credit any other valid analysis.

**AO3 = 6**

**[Total 6 marks]**

**Q29.**

**AO1** – Knowledge and understanding of the processes related to the development of erosional coastal landscapes.

**AO2** – Application of this knowledge to the novel situation; specifically, in accounting for the formation of coastal features such as caves, arches stacks and stumps.

**Level 2 (4–6 marks)**

**AO1** – Demonstrates clear knowledge and understanding of concepts, processes, interactions and change.

**AO2** – Applies knowledge and understanding to the novel situation offering clear evaluation and analysis drawn appropriately from the context provided. Connections and relationships between different aspects of study are evident with clear relevance.

**Level 1 (1–3 marks)**

**AO1** – Demonstrates basic knowledge and understanding of concepts, processes, interactions, change.

**AO2** – Applies limited knowledge and understanding to the novel situation offering only basic evaluation and analysis drawn from the context provided. Connections and relationships between different aspects of study are basic with limited relevance.

Notes for answers

**AO1**

•   Distinctively coastal processes: marine: erosion – hydraulic action, wave quarrying, corrosion / abrasion, cavitation, solution, attrition; sub-aerial weathering.

•   High-energy coasts.

•   Origin and development of landforms and landscapes of coastal erosion: cliffs and wave cut platforms, cliff profile features including caves, arches and stacks; factors and processes in their development.

**AO2**

•   Clearly rock type will be a factor in shaping this landscape. Less resistant rocks would already have been removed by the action of erosion. Some may identify the limestone in the image and suggest that this rock must be able to withstand the constant pounding by the sea over many thousands of years.

•   Others will recognise that this is a landscape in transition and the feature will almost certainly have started out as an expanded join gradually forming into a cave, until the headland was broken through to leave the arch. In the sense rock type has been integral to shaping the changing landscape.

•   Others may consider sub-aerial processes which appear to be impacting upon the limestone further supporting the idea that rock type is a key factor shaping the landscape.

•   Responses should go on to recognise that this is a high-energy environment. There is evidence of undercutting and therefore destructive waves. This is likely to be linked to strong winds and a large fetch as well as deep enough water to sustain the orbital motion of the waves.

Credit any other valid assessment.

Generic explanation of the formation of arches (with no attempt to apply knowledge to the resource and associated information) should be held to Level 1.

**AO1 = 2, AO2 = 4**

**[Total 6 marks]**

**Q30.**

**AO1** − Knowledge and understanding of the role of human activity in coastal landscapes. Knowledge and understanding of the natural processes which shape coastlines.

**AO2** − Applies knowledge and understanding to come to an evaluative conclusion as to whether it is human activity or natural processes which have a more significant role.

Notes for answers

**AO1**

•   Eustatic, isostatic and tectonic sea level change: major changes in sea level in the last 10,000 years.

•   Recent and predicted climatic change and potential impact on coasts.

•   The relationship between process, time, landforms and landscapes in coastal settings.

•   Origin and development of landforms and landscapes of coastal erosion: cliffs and wave cut platforms, cliff profile features including caves, arches and stacks; factors and processes in their development.

•   Human intervention in coastal landscapes. Traditional approaches to coastal flood and erosion risk: hard and soft engineering. Sustainable approaches to coastal flood risk and coastal erosion management: shoreline management / integrated coastal zone management.

•   Case study of a coastal landscape to illustrate and analyse how it presents risks and opportunities for human occupation and development and evaluate human responses of resilience, mitigation and adaptation.

**AO2**

•   Candidates are free to argue in any direction in relation to the question. Some may remain neutral.

•   Some may argue human activity is having considerable activity upon coastlines. Coastal management can have a dramatic impact upon coastal landscapes. A variety of approaches may be considered in relation to hard engineering, soft engineering and managed retreat. Some may also legitimately consider the impact of coastal management in one place upon other stretches of coastline within the same sediment cell.

•   Responses may also consider development and economic activity taking place at the coastline. Provided there is a clear link to how this is shaping the coastal landscape this is a legitimate approach.

•   In terms of natural processes expect consideration of tectonic, eustatic and isostatic change as well as erosion, transport and depositional processes. There should be recognition that these processes have a direct bearing upon specific landform development and wider landscape development. Expect to see reference to coastal landscapes of erosion and / or deposition.

•   Consideration of the cause of the erosional landscapes and features such as caves, arches, stacks and stumps are likely to feature. Responses taking this approach should consider the role of specific erosional processes such as abrasion attrition, hydraulic action, and solution. Some aspects of geology may also feature. Similarly depositional features such as beaches and spits and the factors leading to their formation may also feature. Factors leading to the development of dunes are also permissible i.e. onshore winds, a sediment source and clearly developed intertidal zone.

•   For eustatic change, more sophisticated responses may see the link between human activity and natural processes and consider these two elements in conjunction with each other i.e. that it is the human activity which is exacerbating the eustatic sea level change that is currently being experienced.

•   Responses are likely to be supported by specific examples to support the position taken i.e. places where natural processes have been dominant in shaping the landscape as compared with other places where human activity has been dominant in shaping the landscape.

**Level 4 (16−20 marks)**

•   Detailed evaluative conclusion that is rational and firmly based on knowledge and understanding which is applied to the context of the question. Interpretations are comprehensive, sound and coherent (AO2).

•   Detailed, coherent and relevant analysis and evaluation in the application of knowledge and understanding throughout (AO2).

•   Full evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Detailed, highly relevant and appropriate knowledge and understanding of place(s) and environments used throughout (AO1).

•   Full and accurate knowledge and understanding of key concepts, processes and interactions and change throughout (AO1).

**Level 3 (11−15 marks)**

•   Clear evaluative conclusion that is based on knowledge and understanding which is applied to the context of the question. Interpretations are generally clear and support the response in most aspects (AO2).

•   Generally clear, coherent and relevant analysis and evaluation in the application of knowledge and understanding (AO2).

•   Generally clear evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Generally clear and relevant knowledge and understanding of place(s) and environments (AO1).

•   Generally clear and accurate knowledge and understanding of key concepts, processes and interactions and change (AO1).

**Level 2 (6−10 marks)**

•   Some sense of an evaluative conclusion partially based upon knowledge and understanding which is applied to the context of the question (AO2). Interpretations are partial but do support the response in places.

•   Some partially relevant analysis and evaluation in the application of knowledge and understanding (AO2).

•   Some evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Some relevant knowledge and understanding of place(s) and environments which is partially relevant (AO1).

•   Some knowledge and understanding of key concepts, processes and interactions and change. There may be a few inaccuracies (AO1).

**Level 1 (1−5 marks)**

•   Very limited and/or unsupported evaluative conclusion that is loosely based upon knowledge and understanding which is applied to the context of the question (AO2). Interpretation is basic.

•   Very limited analysis and evaluation in the application of knowledge and understanding. This lacks clarity and coherence (AO2).

•   Very limited and rarely logical evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Very limited relevant knowledge and understanding of place(s) and environments (AO1).

•   Isolated knowledge and understanding of key concepts, processes and interactions and change. There may be a number of inaccuracies. (AO1).

**Level 0 (0 marks)**

•   Nothing worthy of credit.

**AO1 = 10, AO2 = 10**

**[Total 20 marks]**

**Q31.**

**AO1** – Knowledge and understanding of the processes related to the development of mudflats and saltmarshes.

**AO2** – Application of this knowledge to the novel situation; specifically, in accounting for the formation coastal features such as saltmarshes and mudflats.

Mark scheme

**Level 2 (4–6 marks)**

**AO1** – Demonstrates clear knowledge and understanding of concepts, processes, interactions and change.

**AO2** – Applies knowledge and understanding to the novel situation offering clear evaluation and analysis drawn appropriately from the context provided. Connections and relationships between different aspects of study are evident with clear relevance.

**Level 1 (1–3 marks)**

**AO1** – Demonstrates basic knowledge and understanding of concepts, processes, interactions, change.

**AO2** – Applies limited knowledge and understanding to the novel situation offering only basic evaluation and analysis drawn from the context provided. Connections and relationships between different aspects of study are basic with limited relevance.

Notes for answers

**AO1**

•   Sources of energy in coastal environments: winds, waves (constructive and destructive), currents and tides. Low energy coasts.

•   Sediment sources, cells and budgets.

•   Geomorphological processes: transportation and deposition.

•   Origin and development of landforms and landscapes of coastal deposition.

•   Estuarine mudflat / saltmarsh environments and associated landscapes; factors and processes in their development.

**AO2**

•   Clearly deposition is a crucial factor in the development of this landscape. Looking at the information provided, the tide is out and a mudflat is evident. Fine sands and other particles will have been transported from further upstream to be deposited as the river loses energy when it meets the incoming tide. The mudflats are likely to be submerged in large part when the tide comes back in.

•   In the background some should note the presence of vegetation and it is reasonable to assume that this is a saltmarsh. Here the original mudflats will have been colonised by vegetation and trapped more sediment. Over time the saltmarsh has built up so that it is consistently above the high-water mark. In this sense it is the vegetation colonisation which could be argued to be more important in the development of the saltmarsh.

•   Without the influence of the incoming tide, some may argue that the sediment would continue downstream and further into the estuary ie that the tide is the most important factor.

•   The main factors are therefore the sediment deposition, the tidal influence and the colonisation by vegetation. Responses are free to argue for the importance of any factor.

Credit any other valid assessment.

Generic explanation of the formation of mudflats / saltmarshes (with no attempt to apply knowledge to the resource and associated information) should be held to Level 1.

**AO1 = 2, AO2 = 4**

**[Total 6 marks]**

**Q32.**

**AO1** − Demonstrates knowledge and understanding of geomorphological processes of weathering. Knowledge and understanding of the development of coastal landforms.

**AO2** − Application of knowledge and understanding to analyse how different processes of weathering operating over different timescales have direct impacts on the development of distinctive coastal landforms.

**Level 3 (7−9 marks)**

**AO1** − Demonstrates detailed knowledge and understanding of concepts, processes, interactions and change. These underpin the response throughout.

**AO2** − Applies knowledge and understanding appropriately with detail. Connections and relationships between different aspects of study are fully developed with complete relevance. Analysis is detailed and well-supported with appropriate evidence.

**Level 2 (4−6 marks)**

**AO1** − Demonstrates clear knowledge and understanding of concepts, processes, interactions and change. These are mostly relevant though there may be some minor inaccuracy.

**AO2** − Applies clear knowledge and understanding appropriately. Connections and relationships between different aspects of study are evident with some relevance. Analysis is evident and supported with clear and appropriate evidence.

**Level 1 (1−3 marks)**

**AO1** − Demonstrates basic knowledge and understanding of concepts, processes, interactions and change. This offers limited relevance with inaccuracy.

**AO2** − Applies limited knowledge and understanding. Connections and relationships between different aspects of study are basic with limited relevance. Analysis is basic and supported with limited appropriate evidence.

Notes for answers

**AO1**

•   Geomorphological processes of weathering. The specification does not specify named processes, but expect reference to processes of biological, chemical and physical / mechanical weathering.

•   Systems in physical geography: systems concepts and their application to the development of coastal landscapes − inputs, outputs, energy, stores / components, flows / transfers, positive / negative feedback, dynamic equilibrium. The concepts of landform and landscape and how related landforms combine to form characteristic landscapes.

•   Distinctively coastal processes: Sub-aerial weathering. The specification does not specify named processes, but expect reference to processes of biological, chemical and physical / mechanical weathering.

•   Origin and development of landforms of coastal erosion: cliffs and wave cut platforms, cliff profile features including caves, arches and stacks; factors and processes in their development.

•   Origin and development of landforms of coastal deposition. Beaches, simple and compound spits, tombolos, offshore bars, barrier beaches and islands and sand dunes; factors and processes in their development.

•   The relationship between process, time, landforms and landscapes in coastal settings.

**AO2**

•   Assessment − Responses may follow a sequence to illustrate how coastal processes create coastal landforms.

•   Assessment − Responses will refer to processes of weathering in the context of the coastal setting, with evaluation of the role of processes involved. Some may seek to highlight how weathering differs to other coastal processes such as erosion, transportation, deposition and mass-movement.

•   Assessment − Responses may assess how processes of weathering can be responsible for creating coastal landforms themselves, which contribute to distinctive coastal landscapes.

•   Assessment − Responses may consider the role of processes of weathering such as; mechanical or physical weathering, biological weathering, and various forms of chemical weathering. Assessment of the above will seek to show the extent to which they break down *in situ* the underlying rocks of the coastline, and the contribution this makes to the sequence of landform development.

•   Assessment − The processes of weathering identified thus changes the shape and character of characteristic coastal landforms. Responses may suggest that coastal cliffs might be most obviously affected by such processes.

•   Assessment − Some responses will assess the role weathering plays in contributing to the development of coastal landforms alongside other coastal processes. Including how weathering can weaken coastal landforms such as cliffs making them more susceptible to processes of coastal erosion. Weathering also adds sediment to the shoreline which can then be used by other coastal processes: material can be picked up by waves and the wind and be used as agents of erosion, other material can be picked up by both waves and wind and via processes of coastal transportation moved and deposited elsewhere.

•   Assessment − some responses will also assess the role weathering plays in the formation of landforms of coastal erosion and deposition.

•   The key is that there is clear assessment of the link between the processes of weathering and the formation of coastal landforms.

**AO1 = 4, AO2 = 5**

**[Total 9 marks]**

**Q33.**

**AO1** – Knowledge and understanding of submergent and emergent coastal landforms. Knowledge and understanding of predicted future sea level change.

**AO2** – Application of knowledge and understanding to assess the extent to which global sea level rise will outpace any local scale isostatic uplift.

Notes for answers

**AO1**

•   Eustatic, isostatic and tectonic sea level change: major changes in the sea level in the last 10 000 years.

•   Coastlines of emergence and submergence. Origin and development of associated landforms: raised beaches, marine platforms; rias, fjords, Dalmatian coasts.

•   Recent and predicted climate change and potential impact on coasts.

•   The relationship between process, time, landforms and landscapes in coastal settings.

**AO2**

•   Application of knowledge and understanding to assess the scale and role of key future processes, including: predicted sea level change; isostatic rebound; tectonic processes.

•   It is likely that responses will come to the view that the answer depends on the geographical scale at which the question is addressed.

-   Globally, eustatic sea level rise will undoubtedly lead to the accelerating development of submergent features in most parts of the world.

-   More locally, in areas where isostatic rebound is already occurring, or where it begins to happen in the future as more ice on land melts, outcomes will reflect the balance between rates of sea level rise and uplift of land.

-   In some places it is possible that major seismic events could rapidly lead to either uplift or submergence of the land at the coast.

•   Expect responses to come to the view that the accelerating rate at which global sea levels are predicted to rise in the 21st Century and beyond it is most likely that submergent features will develop faster than emergent features.

•   Responses may also come to the view that much will depend upon the rate, and extent, to which humans are able to mitigate both the causes and impacts of future climate change.

•   It is possible, although unlikely, that a response may make reference to the fact that Earth is currently in an interglacial and, at some point, there is likely to be another period of climatic cooling and sea level fall. This is valid.

Any conclusion is acceptable, though should relate to the preceding content.

**Level 4 (16–20 marks)**

•   Detailed evaluative conclusion that is rational and firmly based on knowledge and understanding which is applied to the context of the question (AO2).

•   Detailed, coherent and relevant analysis and evaluation in the application of knowledge and understanding throughout (AO2).

•   Full evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Detailed, highly relevant and appropriate knowledge and understanding of place(s) and environments used throughout (AO1).

•   Full and accurate knowledge and understanding of key concepts and processes throughout (AO1).

•   Detailed awareness of scale and temporal change which is well-integrated where appropriate (AO1).

**Level 3 (11–15 marks)**

•   Clear evaluative conclusion that is based on knowledge and understanding which is applied to the context of the question (AO2).

•   Generally clear, coherent and relevant analysis and evaluation in the application of knowledge and understanding (AO2).

•   Generally clear evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Generally clear and relevant knowledge and understanding of place(s) and environments (AO1).

•   Generally clear and accurate knowledge and understanding of key concepts and processes (AO1).

•   Generally clear awareness of scale and temporal change which is integrated where appropriate (AO1).

**Level 2 (6–10 marks)**

•   Some sense of an evaluative conclusion partially based upon knowledge and understanding which is applied to the context of the question (AO2).

•   Some partially relevant analysis and evaluation in the application of knowledge and understanding (AO2).

•   Some evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Some relevant knowledge and understanding of place(s) and environments which is partially relevant (AO1).

•   Some knowledge and understanding of key concepts, processes and interactions and change (AO1).

•   Some awareness of scale and temporal change which is sometimes integrated where appropriate. There may be a few inaccuracies (AO1).

**Level 1 (1–5 marks)**

•   Very limited and/or unsupported evaluative conclusion that is loosely based upon knowledge and understanding which is applied to the context of the question (AO2).

•   Very limited analysis and evaluation in the application of knowledge and understanding. This lacks clarity and coherence (AO2).

•   Very limited and rarely logical evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).

•   Very limited relevant knowledge and understanding of place(s) and environments (AO1).

•   Isolated knowledge and understanding of key concepts and processes.

•   Very limited awareness of scale and temporal change which is rarely integrated where appropriate. There may be a number of inaccuracies (AO1).

**Level 0**

Nothing worthy of credit.

**AO1 = 10, AO2 = 10**

**[Total 20 marks]**

Examiner reports

**Q1.**

This proved to be a straightforward question with over 90% correctly identifying A as the correct option.

**Q2.**

The development of salt marshes was dealt with sequentially by most students. Some responses focused more on the development of climatic climax vegetation rather than processes usually taking place in estuaries, often behind spits. Credit was still available if taking this approach. However, a number of students confused salt marshes with sand dune development and equally confused pioneer species in dunes with pioneers in salt marshes.

**Q3.**

Just under half of responses reached Level 2 or better, showing that most were able to access this question. Answers that did not score well often exhibited little AO1 knowledge and understanding of mudflats in estuarine environments. Other low scoring responses often focused on the process of longshore drift. Some responses could not access the higher marks as they lacked AO2 application of their knowledge and had limited assessment. The most successful answers had clear and detailed knowledge and understanding of the processes that lead to the formation of mud flats in estuarine environments and assessed the relative importance of these clearly. Some responses suggested that other factors were more important than tides, and as long as this was supported with accurate knowledge and understanding this route was credit worthy.

**Q4.**

Relatively few could offer a full explanation the development of barrier beaches. The idea of longshore drift transporting sediment between two headlands was the main route to credit. Others did consider the idea of an offshore bar rising up above sea level, or forming as a result of isostatic change. Such approaches were credited as reasonable potential causes. It is important that students are familiar with the specification and its contents, particularly with regard to the multiple choice questions and these short knowledge testing questions. Relatively straightforward marks were lost by failing to understand the idea of barrier beach formation.

**Q5.**

In response to the emphasis of this question on the possible negative effects of human activity on the development of landforms of coastal deposition, many students demonstrated clear AO1 knowledge and understanding of relevant factors. The most common approach adopted by students was to assess the impact of various coastal management strategies such as the building of groynes. This approach was credit worthy and the most effective responses were supported with specific detail from illustrative examples. These were often perceptive and showed a clear engagement with specific impacts of specific human activities on specific depositional landforms. Many of the weaker responses showed little knowledge and understanding of the development of specific landforms of coastal deposition.

**Q6.**

It was surprising to see a number of students fail to understand the development of dune systems and the role of vegetation within this. Others simply described dune formation without applying to the resource or the context of the question. More effective responses saw the connection between the vegetation and the dune formation, including the evidence in the background of thicker vegetation coverage and a wider range of species, thus hinting at succession.

**Q7.**

This question proved reasonably accessible to most candidates with around 63% scoring in Level 2. For most this involved using and manipulating data from the graph. Many gave an analysis of the changing extent of beach recognising a 5-fold increase between 2005 and 2009 followed by a smaller increase of about a fifth by 2013. Many made comment on the sudden appearance and disappearance of the spit. The best responses made clear use of both figures. Often these referred to the spatial distribution of a feature including distance or directions that could have only come from the map and supported this with some analysis of data from the graph. The weakest responses simply lifted data from the graph. Some drifted into possible explanation or reasons, many suggesting longshore drift was occurring along the coast. This constituted AO2 and application of own knowledge. There was no credit for this approach.

**Q8.**

Most students correctly identified D as the description of a Dalmatian coast. Whilst 76% of students were accurate, some clearly knew the response related to sea level change and incorrectly chose option A instead.

**Q9.**

Most candidates clearly knew what eustatic sea level change was. There were a small number of responses that confused isostatic and eustatic change, and these gained no credit. Most students made the link between warmer temperatures and the melting of ice, and also stated that it was a global rise or fall in sea level. To achieve the highest mark, it needed to be clear that the student understood that it was the melting of ice on land that added to the height and volume of the oceans. Some tried to suggest that the melting of sea ice caused the additional height and volume of sea water, this was not credited. Many good responses also referred to warmer temperatures leading to the thermal expansion of the oceans which again was credited.

**Q10.**

Many were able to identify that the reduction in ice cover correlated with the increase in sea levels between the two resources. Good application of knowledge then linked this to isostatic and eustatic change. The best then linked this to landscapes of emergence. Raised beaches and drowned valleys were referenced as indicative features in such landscapes. Some were even able to identify places on the map where such features were developing. This was all credited under AO1 / AO2. Where students could not make such links, these responses tended to drift into describing the resource or generic processes.

**Q14.**

On the extended 20 mark response, many had evidently learned about coastal management and simply regurgitated this material and it was difficult to see the tangible link to the question. Some did incorporate management into their response by linking this to the mitigation of the predicted impact of climate change. This was a more effective approach.

**Q17.**

A small number missed the context of the question and wrote about a British case study. The mean mark was 11.47. Most chose Bangladesh (the Sundarbans), the Maldives or India (Odisha). Some responses were a little narrative in approach, writing about the challenges and issues facing the coastal regions without necessarily focusing on the question. More effective responses concentrated on the role of human intervention (intended or otherwise) and how this has affected the landscape. Coastal management (ICZMs), afforestation, fishing and tourism tended to feature here. Others contrasted this with natural processes and made broader links to global warming and its impact. This was also creditworthy.

**Q18.**

Many were well prepared and started their responses by considering glacial erosion as a key factor in shaping the trough prior to submergence and eustatic sea level change. Others considered possible isostatic readjustment. These were all valid approaches. Weaker answers simply described the characteristics and not the processes / factors leading to formation.

**Q21.**

This response produced a mean mark of 4.69 and showed that students generally engaged reasonably well with its requirements. Most showed that wind has a direct impact upon the size and power of waves. Others went further to consider fetch and the role of tides. Not many considered local factors such as the local geomorphology. Some drifted into description of low and high energy coastlines and their features. This scored little credit as it was considered to be the output of the energy and not a factor determining the impact of energy.

**Q24.**

This question had a strong physical geography dimension to it. Those who understood the difference between weathering and erosion were in a strong position. Provided they could apply this to different landscapes and explain how these processes contributed to the landscape formation, they were in a strong position. A number could not distinguish between the processes. Finding credit in this situation was difficult. Place reference and detailed support was generally not strong, though case studies such as Holderness did emerge. Some students did consider the relative importance of these two distinct processes, and then considered depositional processes and the role of human intervention in coastal processes. This was credited as relevant in terms of the AO2 element of the question.

**Q29.**

In this question, most identifed that it was an arch but did not get much beyond processes in the development of an arch. This only constituted AO1 and AO2 marks could not be awarded. More focus was needed on the high energy environment and other evidence in the photograph.

**Q30.**

Students generally engaged well with this question but it also differentiated well. 58% accessed Level 3 or better with a clear focus upon the context of the question. Students were required to contrast the impact of human activity with natural processes upon coastlines. Some were a little unbalanced favouring one or the other. This was permissible if coherently argued. For human activity, many considered the role of intervention through coastal management and its unintended consequences, for instance at Hornsea on the Holderness coastline. For natural processes, many considered erosional and depositional processes and their impacts. Human induced climate change also featured and its association with sea level change. This was also a valid approach.

**Q31.**

Many quickly established that this is a mudflat and saltmarsh area in an estuary. Those that did, readily accessed credit with some sound argument around the importance of different factors. Many argued that it is actually the vegetation being highly adapted and trapping sediment which is the most important factor. Students were free to argue their own position as long as there was a sustained line of reasoning.

**Q32.**

60% of responses reached Level 2 or better, showing most students found this question accessible. However, the mean mark was 4.23 indicating that many were not able to access the full range of marks available. Answers that did not score well often confused processes of erosion and weathering. Others showed poor AO1 knowledge of the detail of processes of weathering. Some responses could not access the higher marks as they lacked AO2 application of their knowledge and had limited assessment. The best answers had detailed assessment of the role of weathering in relation to specific coastal landforms, supported with detailed knowledge and understanding of specific weathering processes. Some assessed the role of weathering in relation to other factors, such as erosion or mass movement, as long as the role of weathering was key to the assessment this route was creditworthy.

**Q33.**

Just under half of students accessed this question well giving responses that reached Level 3 or better, but around a quarter also only scored in Level 1, so it did differentiate quite well. The best responses demonstrated clear detailed knowledge of a range of specific submergent and emergent features, and secure knowledge about possible factors that would affect their development in the future. Most started with the supposition that due to climate change and warming, sea levels will rise at an increasing rate in coming decades, with the best answers offering some quantitative support. Many then suggested that this global eustatic rise in sea level will indeed lead to the more rapid formation of submergent features. However, the best responses then countered this with reference to more localised areas where isostatic uplift may outpace the predicted sea level rise. Weak responses showed little understanding of the above, and often focused on erosional and depositional landforms.