

**Drayton Manor High School**

|  |
| --- |
| Exam Question |
|

|  |  |
| --- | --- |
| (a) (i) | Explain the formation of the discordant coastline shown in Figure 1. *(6 marks)* |

 |
|

|  |  |
| --- | --- |
| (a) (ii) | Study Figure 2, which shows the geology of the coast around Lulworth Cove, Dorset. Explain how recession rates may have been affected by alternating rock strata and geological structure along this concordant coastline. *(6 marks)* |

 |
|

|  |  |
| --- | --- |
| (b) | Explain how different wave types influence annual beach morphology and sediment profiles. *(8 marks)* |

 |
|

|  |  |
| --- | --- |
| (c) | Assess the role that short-term and long-term processes of sea level change have on coastal areas. *(20 marks)* |

 |
| **Total:** 40 marks |

|  |
| --- |
| Source |
| **Figure 1: The discordant coast of West Cork, Ireland****Figure 2: A geological map of the coast around Lulworth Cove, Dorset** |

|  |
| --- |
| Mark scheme |
|

|  |  |
| --- | --- |
| (a) (i) | 6 marks (AO1 = 3 marks, AO2 = 3 marks)**AO1 Demonstrating your knowledge and understanding** • Discordant coastlines are characterised by a series of headlands and bays. • More resistant rock forms the headlands as it is less vulnerable to erosion from the sea by processes such as hydraulic action and abrasion. • In contrast, bays occur where less resistant rock is found — erosion by the sea causes the coastline here to retreat more rapidly.**AO2 Applying your knowledge and understanding** • The varying geology of West Cork has contributed to the formation of the discordant coast here. • Limestone is less resistant to erosion and so it has retreated more rapidly to form bays such as Bantry Bay. • On the other hand, more resistant rock, including sandstone and mudstone, has resisted erosion and so forms the headlands.**Answers to this question will be given a mark within a level band****Level 1 (1–2 marks):** You show limited geographical knowledge and understanding of the formation of the discordant coastline. You apply your knowledge and understanding of the formation of the discordant coastline with limited effect, making limited connections between aspects of your answer and supporting your interpretations with limited evidence.**Level 2 (3–4 marks):** You show mostly relevant and accurate geographical knowledge and understanding of the formation of the discordant coastline. You apply your knowledge and understanding of the formation of the discordant coastline, making some connections between aspects of your answer as appropriate and supporting your interpretations with some evidence.**Level 3 (5–6 marks):** You show relevant and accurate geographical knowledge and understanding of the formation of the discordant coastline throughout. You apply your knowledge and understanding of the formation of the discordant coastline throughout your answer, making sound connections between aspects of your answer as appropriate and supporting your interpretations logically with evidence.**Hints and tips**Give a clear explanation of the relevant processes here. Develop your points to show good depth of understanding. |

 |
|

|  |  |
| --- | --- |
| (a) (ii) | 6 marks (AO1 = 3 marks, AO2 = 3 marks)**AO1 Demonstrating your knowledge and understanding** • Where rock strata run parallel to the shoreline we find concordant coasts. • This means that, unlike discordant coasts, geology tends to vary less along a coastline. • However, geological structure can create more complex patterns along these shorelines. For example, where a rock strata has faults and/or joints, the sea can erode more quickly here and can cause the rock type along the coastline to be breached, increasing erosion behind it.**AO2 Applying your knowledge and understanding** • In the case of the Lulworth Cove area, this appears to be exactly what has happened. The more resistant rock adjacent to the sea has been breached where faults or joints occurred. • The rock running parallel behind it has clearly been less resistant to erosion and a series of bays have formed along the shore, such as Lulworth Cove. • The extensive area of chalk behind these other rock types has resisted erosion, causing the bays to extend out laterally along the coastline.**Answers to this question will be given a mark within a level bandLevel 1 (1–2 marks):** You show limited geographical knowledge and understanding of how recessional rates have been affected by geology on this coastline. You apply your knowledge and understanding of how recessional rates have been affected by geology on this coastline with limited effect, making limited connections between aspects of your answer and supporting your interpretations with limited evidence.**Level 2 (3–4 marks):** You show mostly relevant and accurate geographical knowledge and understanding of how recessional rates have been affected by geology on this coastline. You apply your knowledge and understanding of the formation of how recessional rates have been affected by geology on this coastline, making some connections between aspects of your answer as appropriate and supporting your interpretations with some evidence.**Level 3 (5–6 marks):** You show relevant and accurate geographical knowledge and understanding of how recessional rates have been affected by geology on this coastline throughout. You apply your knowledge and understanding of how recessional rates have been affected by geology on this coastline throughout your answer, making sound connections between aspects of your answer as appropriate and supporting your interpretations logically with evidence.**Hints and tips**Give a clear explanation of the relevant processes here. Make sure you develop your points to show good depth of understanding.  |

 |
|

|  |  |
| --- | --- |
| (b) | 8 marks (AO1 = 8 marks)**AO1 Demonstrating your knowledge and understanding**There are two main wave types: constructive and destructive.*Constructive waves* have the following characteristics: • Longer wave lengths and lower wave heights. • Spilling breakers with a strong swash and weak backwash. • They occur on more gently sloping beaches. • They are common during less stormy conditions, e.g. the summer.*Destructive waves* have the following characteristics: • Shorter wave length and higher wave heights. • Plunging breakers with a weak swash and strong backwash. • They occur on more steeply sloping beaches. • They are common during stormy conditions, e.g. the winter.*Beach morphology* is affected by these waves: • Constructive waves tend to move material from the offshore zone further up the beach. So, over time, they tend to increase beach gradient. • Destructive waves tend to move material from the top of the beach and take it down towards the bottom of the beach. So, over time, they tend to decrease beach gradient. • This means that there is an annual cycle in beach profile: steeper, lower beaches found in the winter, and gentler, higher beaches found in the summer.*Sediment profiles* are also affected by these waves. Storm beaches are found at the top of the beaches, formed as very coarse sediment is thrown up to the top of the beach by destructive waves during extreme storms. The middle section of the beach is usually sand. The off-shore bar is formed as destructive waves carry sediment off the beach and deposit it off-shore.**Answers to this question will be given a mark within a level bandLevel 1 (1–2 marks):** You show limited geographical knowledge and a narrow understanding of the effect of wave type on beach profiles. Part of your answer may be inaccurate or lack detail.**Level 2 (3–5 marks):** You show mostly relevant geographical knowledge and understanding of the effect of wave type on beach profiles. Some parts of your answer are not fully developed.**Level 3 (6–8 marks):** You show accurate and relevant geographical knowledge and understanding of the effect of wave type on beach profiles. Your answer is detailed and fully developed. **Hints and tips**'Explain' questions require you to show good understanding of how these wave types affect the shore — justify your points to demonstrate this understanding. |

 |
|

|  |  |
| --- | --- |
| (c) | 20 marks (AO1 = 5 marks, AO2 = 15 marks)Some suggested ideas are given below but you may wish to expand on these or include other relevant points.**AO1 Demonstrating your knowledge and understanding** • Coastal areas have a variety of landforms that can be affected by changes in sea level, both long term and short term. • The orientation of the coastal geology (concordant or discordant) can affect how coasts respond to changes in sea level. For example, concordant coastlines such as the Dalmatian Coast form a series of linear offshore islands parallel to the shore, produced as valleys flooded when sea levels rose. • The steepness and topography of the coastline will affect how it responds to changes in sea level (e.g. New Orleans below sea level).**AO2 Applying your knowledge and understanding**There are various processes, both long term and short term, that can affect sea level: • Short term: tides, tidal range (spring and neap tides), storm surges. • Long term: isostatic and eustatic changes in sea level.These are produced by various processes: • Short term: tides and the gravitational effect of the moon; low pressure and storm surges. • Long term: glacial and interglacial periods, tectonic processes, climate change.Long-term changes result from a complex interaction of isostatic and eustatic causes, sometimes working at the same time on a section of coast. These changes produce a series of landforms which can be submergent or emergent.**Answers to this question will be given a mark within a level bandLevel 1 (1–5 marks):** You include isolated points of geographical knowledge and understanding of the effect of long- and short-term processes of sea level change on coasts, with some errors and inaccuracies. You have not made connections from the question to points made. Your answer is incoherent and lacks relevant evidence to support ideas. Your argument is limited, with unbalanced points. Points that you make are concluded in a general manner, if at all.**Level 2 (6–10 marks):** You make some points showing geographical knowledge and understanding of the effect of long- and short-term processes of sea level change on coasts, some of which may be relevant. You make some inaccurate points. You apply some knowledge and understanding of the effect of long- and short-term processes of sea level change on coasts but your ideas are not developed or may not be linked directly to the question. You use some evidence to support statements, which may answer only part of the question. You make a conclusion but this is drawn from often unbalanced ideas.**Level 3 (11–15 marks):** You make generally relevant points showing geographical knowledge and understanding of the effect of long- and short-term processes of sea level change on coasts. Your ideas are mostly accurate and some connections are made between ideas. You interpret the question well in general but there may be some gaps in the use of evidence to support points. You draw a conclusion that links to the arguments made but is not fully supported by evidence.**Level 4 (16–20 marks):** You show good use of geographical knowledge and understanding of the effect of long- and short-term processes of sea level change on coasts. You make a range of relevant points to create a coherent argument supported by appropriate evidence. You apply your knowledge well throughout. All points you make are linked to the question. You draw a good, well-balanced conclusion that links clearly to the evidence presented. **Hints and tips**Give balanced attention to both of the processes (short and long term) and reach an overall assessment of their relative impact. |

 |

|  |
| --- |
| Student Response A |
| (a) (i) | A discordant coastline is one where you find a series of headlands jutting out into the sea and bays eroded back into the land. These are found typically where you have different types of geology at a coastline and where these bands of different rock are aligned perpendicular with the coastline.

|  |
| --- |
| **Examiner comment**Good understanding of the nature of and conditions required for discordant coastlines shown. |

In West Cork, we can see that this is indeed the case. The main coastline runs from north-west to south-east and there is a series of different rock types (including purple mudstone, limestone and old red sandstone) running at right angles to the shoreline.

|  |
| --- |
| **Examiner comment**The student has applied their knowledge to the specific location shown in the figure. |

Where you have different rock types, they can erode at different rates. The less resistant rock is eroded faster by coastal processes such as hydraulic action and abrasion. This causes them to retreat to form bays. Meanwhile, the more resistant rock does not retreat at the same rate due to erosion, and so it forms bays that jut out from the coastline.

|  |
| --- |
| **Examiner comment**The student shows good understanding of the processes at work to form discordant coasts. |

We can see this happening in West Cork. Evidently, the areas of limestone are more vulnerable to erosion. These areas in particular have retreated through erosion to form three main bays including Dunmanus Bay, Bantry Bay, and Kenmare River bay. Bantry Bay has been eroded back over 30 km. In fact, it is likely that these large bays are so big because of additional flooding following the end of the last glacial period as sea levels rose and river valleys were flooded to form rias. In contrast, the sandstones and mudstones have not been eroded to anywhere the same extent and they form a series of headlands sticking quite far out into the sea.

|  |
| --- |
| **Examiner comment**The student makes good use of the figure to apply general understanding to the context of West Cork. |

However, there is some evidence that the headlands themselves are not being subject to significant erosion. For example, Clear Island, a section of old red sandstone towards the south-east of the map, has been separated from the rest of the headland. This is because wave refraction around headlands tends to concentrate erosion there. Some form of weakness, possibly a fault, has allowed erosion to cut right through the headland here, forming the island.

|  |
| --- |
| **Examiner comment**Very good application of understanding to this one particular aspect of the stimulus material. Level 3, 6 marks. |

 |
| (a) (ii) | Concordant coasts are often found where the geological strata run parallel to the coastline. In places like this, in contrast to discordant coasts, the geology tends not to vary as much as you move along the coastline. This might suggest that erosional rates would remain similar along the coast and that you would not find the headlands and bays you find at discordant coasts. However, this is not the case, due to other factors including geological structure. For instance, the rock strata running along the coast will have faults (major weaknesses in the rock) and joints (fractures in the rock). These are much more susceptible to erosion and can allow the coastline to retreat at certain points, forming headlands and bays.

|  |
| --- |
| **Examiner comment**Detailed and extensive understanding shown of the nature of this coastline and the role geological structure can play in its development. |

We can see these processes in action in the Lulworth Cove area. The Portland beds and Purbeck beds run parallel to the shoreline and are more resistant to erosion. However, there are various bays that have formed here, including Lulworth Cove and the more extensive Mupe Bay/Worbarrow Bay. These have most likely formed as a result of faults and joints in the Portland and Purbeck beds. These would have allowed erosion to be concentrated here and to break through these strata, beginning to erode the softer Wealden and Gault beds behind. It seems that the extensive stratum of chalk that runs behind all the other strata is more resistant to erosion as the bays do not extend back into this rock type. Rather, erosion seems to be occurring laterally along the Wealden and Gault beds, especially along the 1 km wide bay at Mupe Bay/Worbarrow Bay.

|  |
| --- |
| **Examiner comment**The student applies their understanding effectively to the situation in the Lulworth Cove area, suggesting how the strata and geological structure have affected the development of this coastline. [Level 3, 6 marks.] |

 |
| (b) | There are two main wave types that typically occur at different times of the year. The first is constructive waves. These are more common during the summer and are associated with less stormy conditions. These waves are characterised by longer wave lengths and so lower wave heights. When they reach the beach, their low wave heights mean that they have spilling breakers which have stronger swash and a weaker backwash.In contrast, destructive waves are more common in the stormy conditions normally found in the winter. These have higher wave heights and so their wave lengths are shorter. As they break on the beach, the taller waves tend to produce plunging breakers which break more vertically. This gives them less forward momentum and so they have a weaker swash and a stronger backwash.This annual variation in wave type causes beach morphology to vary annually too. The plunging breakers and strong backwash of the destructive waves remove sediment from the top of the beach and carry it offshore. This not only lowers the level of the beach overall, but also makes the profile less steep. As the spring and summer come around, however, constructive waves with their spilling breakers and stronger swash tend to move sediment back onto and up the beach. This increases beach height and slowly increases its gradient too. So we have an annual cycle of changing beach profile linked to different waves dominating at different times of the year.These waves also influence the beach sediment profiles. The most severe destructive waves during the winter throw the coarsest sediment up to the very top of the beach, forming a storm beach made up of shingle. Only the destructive waves have enough energy to move the largest beach material. The finer material including sand is found further down the beach, including the offshore bar which is a deposit of sand carried off the beach by the strong backwash of the destructive waves.

|  |
| --- |
| **Examiner comment**This is a detailed and comprehensive answer that shows accurate and relevant knowledge and understanding throughout. Level 3, 8 marks. |

 |
| (c) | There are various ways in which sea levels can change, and these can be classified as short term or long term. First, short-term changes can result from tides. In addition to the usual daily tides, sea level can vary a bit more over the course of a month — these are called spring or neap tides. Spring tides occur when the moon and sun are aligned with each other and produce slightly greater tidal ranges. Neap tides occur seven days after spring tides and occur when the moon is at right angles to the sun. The gravitational pull is slightly less, so tidal ranges are slightly lower. Tides affect coastal features such as mudflats. Where coastal topography is gently sloping and where tides move in and out slowly, mudflats may occur. If the tides are not too strong, the mudflats may be stable enough to allow salt marshes to form. The plants and animals here are adapted to the daily tidal inundation.

|  |
| --- |
| **Examiner comment**The student shows a good understanding of short-term tidal change and has linked it well to its effects on the coast. |

Short-term sea level rise may result from more unusual events that can affect coastal areas. For example, during hurricanes low-lying coastal areas are vulnerable to the impacts of a storm surge. This occurs due to the extreme low pressures found in hurricanes and other tropical storms. As a result of the reduction in the weight of the atmosphere above it, the ocean level may rise significantly. Hurricane Katrina raised the sea level along the Louisiana coastline by close to 10 m. This then can cause severe coastal flooding, which indeed happened in New Orleans. Flooding here resulted as the levees designed to protect the city failed and the storm surge was able to enter the city. This was further compounded by the topography of New Orleans. Much of the city is below sea level, and once this water entered the city it stayed there, only being pumped out nearly a week after the hurricane struck. This coastal flooding also increased erosional rates of the Mississippi delta.

|  |
| --- |
| **Examiner comment**The student demonstrates a very good grasp of the connections between various factors that affected storm surge flooding in New Orleans. |

Short-term change in sea level may also result from tectonic processes. For example, the magnitude 9.0 earthquake that struck off the coast of Japan in 2011 lowered the level of the land in the Sendai Plain. Before the earthquake, around 740 acres were below sea level on the Plain — this rose to nearly 4,000 acres after the quake. This resulted from the land suddenly rebounding because of the sudden movement of the plate at the destructive margin to the east of the country. As the Eurasian Plate and the Pacific Plate collided, compression forces beyond the margin caused the Japanese coastline to rise slightly (like a crumple zone in the front of a car being compressed if it collides with a brick wall). However, when these tectonic pressures were released, the compression force was also released, allowing the coastline to sink back down again slightly. The impact of this change will be that these low-lying areas are much more at risk of flooding from the likes of typhoon storm surges.

|  |
| --- |
| **Examiner comment**The student shows a very good understanding of how tectonic forces can produce changes in sea level and has explained well their impact on Japan. |

Second, sea level may change on longer timescales. One of the factors producing these changes is the change from glacial to interglacial periods producing isostatic (local) and eustatic (global) changes in sea level. As the world enters a period of more intense glaciation, eustatic sea level fall can occur as more and more of the Earth’s water is locked up in continental ice. As we then enter an interglacial (as we did nearly 12,000 years ago), the melting of the glacial ice can add more water to the seas and oceans, producing a eustatic rise in sea level. However, this rise can be affected by isostatic changes in local regions. For example, immediately following the last glacial period in the British Isles, sea levels rose eustatically. At the same time, the melting of the ice on the land removed a significant weight and caused the land to rebound upwards. So, as the sea levels rose, the land rose too. The relative rates of these movements are key as to whether or not a stretch of coastline experiences rising or falling sea levels. At first, the eustatic rise was faster than the isostatic sea level fall. But, today, many parts of the British Isles are still rebounding isostatically. The area around Glasgow is rising at the rate of around 1.5 mm per year. At the same time, the south-east of England is sinking very slowly. It was not glaciated during the last glaciation, and as a result the whole northern part of the British Isles is springing upwards, while the south-eastern portion is pivoting downwards slightly.These complex changes produce a range of landforms. If sea levels are rising, then coastal areas experience relatively rapid flooding. If this occurs, it can produce features such as rias — these are large estuaries formed as the rising sea flooded pre-existing river valleys, often far inland. Fjords, similarly, are flooded river valleys. However, they differ from rias in that they have very steep sides and are very deep. These result from glacial erosion which produced steep-sided, U-shaped valleys and are common in Scandinavia. Rias and fjords are examples of submergent landforms.Emergent landforms can occur where sea levels are falling. As the level of the water drops, features produced by coastal processes can rise up, often many tens of metres, above the current level of the sea. Emergent features include raised beaches (flat areas of former beaches or wave-cut platforms that are now well above the current beach) and fossil cliffs (sudden cliffs, maybe hundreds of metres inland, previously produced by coastal erosion).The landforms produced can also be affected by the underlying geology and structure of the coast. For example, the Dalmatian Coast of the Adriatic Sea has a series of linear offshore islands running parallel to the main coastline. These are submergent features formed as sea levels rose. In this case, the limestone rock there was folded, forming a series of linear synclines (valleys) and anticlines (ridges). When the sea level rose, the synclines flooded, forming the islands.

|  |
| --- |
| **Examiner comment**The student shows a very well-developed grasp of the very complex interactions that result from glacial and interglacial sea level change and has supported interpretations with many examples of evidence. |

In light of the above, you can see that sea level adjustments result from the complex interplay of a variety of factors in operation at the same time, over a variety of timescales, and can have wide-ranging impacts on coastal areas and the people who live there.

|  |
| --- |
| **Examiner comment**A coherent conclusion, drawing together the various strands of the assessment. Level 4, 19 marks. |

 |

|  |
| --- |
| Student Response B |
| (a) (i) | A discordant coast is found where you have different types of geology at a coastline. Harder rock is found next to softer rock. The rock types meet the coast at an angle and so geology can be variable depending on where you are at the coast.

|  |
| --- |
| **Examiner comment**Some understanding of the characteristics of the discordant coast shown, but the student should discuss the series of headlands and bays that result. |

You can see these different rock types in West Cork. The limestone strata have clearly been eroded back much further inland to form bays at places like Dunmanus Bay. But the sections of more resistant rock have not been eroded as much and so stick out and form headlands. Other bays include Bantry Bay and Kenmare River. These have been eroded by processes such as hydraulic action and abrasion to create these large bays.

|  |
| --- |
| **Examiner comment**The student attempts to apply their understanding to the figure, but the answer requires much more detail in terms of understanding of the processes at work here. In addition, the connections between the stimulus material and the question need to be drawn out more. The answer could be more clearly organised and structured. Level 2, 3 marks. |

 |
| (a) (ii) | Where rock strata are parallel to the coastline, then you have concordant coasts. You can still find headlands and bays here, however, because of other factors that can help them develop. These include geological structure. If there are areas of weakness in the rock, known as faults, these can erode more quickly and the sea can carve out bays in the softer rock behind.

|  |
| --- |
| **Examiner comment**The student demonstrates some good and relevant knowledge here, but it could be developed in more detail to show fuller understanding. |

In the Lulworth Cove region, we find bands of rock running parallel to the shoreline. These consist of rocks such as Portland beds and Purbeck beds. These are more resistant rocks, but they have faults in them. These faults have eroded over time to form bays here such as Lulworth Cove. Once the sea has eroded through the Portland and Purbeck beds, it has eroded out the softer Wealden and Gault beds behind. This process carved out the bay found at Lulworth Cove.

|  |
| --- |
| **Examiner comment**Again, there is some good application here to the figure, but the answer only makes some of the connections between the stimulus material and the question needed to reach Level 3. Level 2, 4 marks. |

 |
| (b) | There are two main wave types common at different times of the year. The first is constructive waves which are more common during the summer and are associated with less stormy conditions. These waves have longer wave lengths and so lower wave heights. Second, destructive waves are more typical in the stormy conditions of winter. These have higher wave heights and shorter wave lengths.

|  |
| --- |
| **Examiner comment**The student outlines some of the key features of the two waves, but does not include other important elements, such as references to swash and backwash. |

As a result, beach morphology can change over the course of the year. During the winter, beaches tend to be lower as the destructive waves move sediment off the beach. This also tends to make them become less steep. However, during the following summer, the beaches get their sediment back again as the constructive waves sweep it back onto the beach.The beach sediment profiles are also affected by these waves. Destructive waves move the largest sediment to the top of the beach during storms, creating a storm beach of shingle at the top. The rest of the beach is made up mostly of sand, carried onto the beach from the offshore bar by the constructive waves.

|  |
| --- |
| **Examiner comment**The answer is relevant to the question asked, but the ideas are not explored in enough detail. As a result, the answer is underdeveloped. Level 2, 4 marks. |

 |
| (c) | Short-term changes are the result of tides. In addition to the usual daily tides, sea level can vary a bit more over the course of a month — these are called spring or neap tides. Spring tides occur when the moon and sun are aligned with each other and produce slightly greater tidal ranges. Neap tides occur 7 days after spring tides and occur when the moon is at right angles to the sun. The gravitational pull is slightly less, so tidal ranges are slightly lower. One of the coastal landforms that can be affected by tides is mudflats. These form when the tide moves in and out more slowly and where you have a shallow offshore gradient. Spring tides can also lead to problems of coastal flooding. For example in January 2017, a spring tide corresponded with strong winds in the North Sea to cause flooding on eastern England. The high tides and strong winds funnelled the water south towards mainland Europe. As a result, 5,000 homes on the east coast of England were evacuated and lowland in North Norfolk flooded.Tropical storms can also cause storm surges because of the extreme low pressure found in these storms. For example, the sea level rose by up to 10 m in the storm surge produced by Hurricane Katrina in 2005. This inundated the city of New Orleans as the levees burst and the city was flooded. As the city lies below sea level, this water was unable to drain away. Hurricane Katrina was one of the worst natural disasters to affect the USA in modern times.Tectonic processes can also affect sea levels in the short term. When earthquakes occur at destructive margins, the land can suddenly sink or rise up. In Japan in the 2011 earthquake, sections of the coast sank down a bit. This allowed the tsunami to overtop some of the flood defences, and has left the country more vulnerable to tsunamis in the future. In contrast, an earthquake in New Zealand in 2016 caused the sea bed to rise by 2 m, lifting up some previously submerged landforms above sea level along parts of the coast.Sea levels can also change over longer time periods. As our planet has moved between glacials and interglacials during the Pleistocene and into the Holocene, sea levels have risen and fallen. Global rises in sea level are called eustatic rises — local rises are called isostatic rises. Eustatic rises occur when ice that was on the land melts and enters the sea. Isostatic falls also occur when the ice melts — but in this case the weight of the ice coming off the land causes it to rebound upwards, lifting the land ‘out of’ the sea and causing sea levels in effect to fall. These two changes interact in a complex way. Sea level can be rising eustatically while at the same time falling isostatically. You can end up with complex coastal landforms as a result. If the sea level is falling, then former coastal features can now be found raised up above the sea and a few hundred metres inland, for example raised beaches and fossil cliffs. If it is rising, then the sea can flood inland forming features like rias (flooded river valleys) and fjords (flooded U-shaped valleys in glacial areas).

|  |
| --- |
| **Examiner comment**The student includes a range of relevant points and shows geographical understanding throughout. To score more highly, a wider range of points could be included to show breadth of understanding — for example, showing how geology can interact with eustatic sea level rises on the Dalmatian Coast. More connections could then be made between various factors, so gaining more marks. There is good use of examples, but again, more would have added to the evidence. Finally, more detailed explanation of points, for example explaining precisely how eustatic and isostatic changes interact, would have allowed the student to explain connections. Level 3, 12 marks. |

 |