Mark Scheme (Results)

June 2022

Pearson Edexcel
AS Level in Geography
(8GE01)
Paper 1: Dynamic Landscapes

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question number	Answer	Mark
1(a)	**AO1 (1 mark)** Award **1 mark** for a correctly identified characteristic: • Magnitude ❶ • Speed of onset ❶ • Areal extent ❶ • Duration ❶ • Frequency ❶ • Spatial predictability ❶. Accept any other appropriate response, including some human characteristics, e.g. vulnerability.	(1)

Question number	Answer	Mark
1(b)(i)	**AO3 (2 marks)** Award **1 mark** for each correctly calculated stage. Allow error carried forward. On the scale, 5km = 3.7 / 3.6 cm, so 1cm = 1.35 / 1.39 km. The printed width size of the box on a standard exam booklet is 8.6-8.9cm. Therefore, the width of box A could be in the range of 11.61km to 12.38km. Length of Box A = 15km The final area of the box could be 174.15 - 185.8km^2. • Award a correct measurement of the box on the exam paper ❶ • Award a correct conversion of the measurement to calculate the width of Box A = 13km (accept from 11.6 to 12.4km) ❶ • Award a correctly calculated area of the Box A, e.g. from 174-186km^2 ❶. Accept error in the range identified above. Allow a mark for incorrect final answer if correct method is used to calculate the area.	(2)

Question number	Answer	Mark
1(b)(ii)	**AO1 (2 marks)/AO2 (1 mark)** Award **1** mark for analysing the resource to suggest a reason for increased risk, and a further **2** marks for justifying the possible reason, for example: • Steep sided valley sides increase shear stress / chance of landslides / rockfalls ❶ which means there is more weight on the slope ❶ making it more likely to move if there is an additional trigger / heavy rainfall ❶. • More landslides might occur because of earthquakes ❶ which could destroy houses / block river valleys ❶ leading to further deaths / destruction / flooding ❶ . • Being a mountainous region increases isolation / creates many steep slopes ❶ so road access is already limited ❶ and can easily be destroyed by landslides / makes emergency support difficult ❶. • The dam could be damaged ❶ by earthquakes / landslides ❶ which creates flood risks for communities downstream ❶. • Population density / people living by the river are concentrated into narrow valleys / ❶ which can then be cut off after a landslide / flooded ❶ making it hard to rescue or help ❶. Accept any other appropriate response based on figure 1.	**(3)**

Question number	Answer	Mark
1(c)	**AO1 (4 marks)** For each reason, award **1** mark for explaining one aspect of a convergent plate marking and a further **1** mark for developing that explanation to explain how that process works. For example: • Subduction drags an oceanic plate downwards ❶ because of the influence of convection currents / it is denser than the crust it is converging with ❶. • Denser oceanic crust sinks ❶ because it is made of basalt which has a different chemical composition ❶. • Slab-pull is caused by subduction ❶ because of the weight of cold, denser plate material sinking into the mantle at the ocean trench ❶. • Folding creates mountains ❶ as two continental plates collide / force land upwards / subduction causes the crust to buckle under pressure ❶. • Earthquakes happen in the subduction zone / Benioff zone ❶ because of build up, and release of friction as the plates move past each other ❶ • Volcanoes / underwater volcanoes eruption as magma rises through the crust ❶ because a magma chamber has been destabilised because of an earthquake / crust has previously melted building up a magma chamber / subduction of oceanic crust ❶. Accept any other appropriate response, including comments about collision plate boundaries.	**(4)**

Question number	Answer
1(d)	**AO1 (6 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the levels-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. Relevant points may include: • A megadisaster is an extreme disaster which has a global impact. • The areal extent might be large, because tectonic impacts combine with other physical geographical factors, e.g. Eyjafjallajökull 2010 erupting under a glacier creating extremely sharp ash that was carried by the jet stream across Europe – caused estimated US$1.7bn of loss for the global airline industry • Other economic impacts might be linked to global response, e.g. the investment in detention/warning systems after the 2004 Indian Ocean tsunami, or requires a change to government policy in other countries, e.g. the 2011 Japan Tsunami impact on nuclear power. • Human vulnerability might significantly increase the human impact – e.g. Guatemala 1976 killed 23,000mainly in slum areas, e.g. Gujarat 2001 killed over 20,000 ethnic minority groups who had a poor capacity to copy (e.g. lacked emergency aid) • The size of the event, e.g. Mt Tambora in 1815, made it the largest eruption in human history (100,000 dead). If no example named, the answer is unlikely to go out of level 2. Likely examples might include Iceland eruption in 2010 and Japan tsunami in 2011.

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	**1–2**	• Demonstrates isolated elements of geographical knowledge and understanding, some of which may be inaccurate or irrelevant. (AO1) • Understanding addresses a **narrow** range of geographical ideas, which lack detail. (AO1)
Level 2	**3–4**	• Demonstrates geographical knowledge and understanding, which is **mostly** relevant and may include **some** inaccuracies. (AO1) • Understanding addresses a **range** of geographical ideas, which are **not fully** detailed and/or developed. (AO1)
Level 3	**5–6**	• Demonstrates accurate and relevant geographical knowledge and understanding throughout. (AO1) • Understanding addresses a **broad** range of geographical ideas, which **are** detailed and **fully** developed. (AO1)

Question number	Answer.
1(e)	**AO1 (3 marks)/AO2 (9 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the levels-based mark scheme below. Responses that demonstrate **only** AO1 without any AO2 should be awarded marks as follows: • Level 1 AO1 performance: 1 mark • Level 2 AO1 performance: 2 marks • Level 3 AO1 performance: 3 marks. **Indicative content guidance** The indicative content below is not prescriptive and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. Relevant points may include: **AO1** • The power of earthquakes is measured mainly by the Richter scale, which measures the amount of energy released, and in turn through PSL waves • The impact of an earthquake might be measured by the number of deaths and injuries. Some earthquakes might trigger secondary hazards, e.g. tsunami / landslides. • Wealth might be linked to vulnerability, or capacity to cope. This might be seen through the social impact (the number of deaths and/or injuries). Both of these might be reduced by a country having a higher capacity to cope, which might be reflected by it's GDP. **AO2** **Wealth (GDP per capita) does affect** the impact of the earthquakes • The highest number of injuries from an earthquake alone is in Lombok, which has one of the highest magnitude events, but considerably lower wealth than Taiwan or Japan. **Wealth doesn't affect** the impact • Japan has a relatively high number of injuries despite the earthquake being relatively low magnitude – perhaps reflect the economic impact on high value infrastructure and high population density. • One of the biggest social impacts was in Sulawesi, with the highest number of deaths, injuries and evacuations. This was significantly higher than Lombok, in the same country, with the same GDP. **Other factors** affect the impact • The other difference between Lombok and Sulawesi EQ was the size of the tsunami (7m v 10cm) in Sulawesi, which is probably linked to a higher EQ magnitude. • The least powerful earthquake (Haiti) resulted in one of the lowest death tolls / injuries – and this was also the lowest wealth. Good answers will use a full range of data from the hazards presented together with their own ideas about risk. For example, risk might be

Question number	Answer.	
	considered from the point of view of the hazard risk equation. Some answers might question the range of data presented, e.g. it is a snapshot for one year with a narrow range of high impact earthquakes. They might draw on examples from other years. Judgements will be based around whether the most powerful always result in the highest number of e.g. deaths, most noting that generally other factors determine the overall level of risk (i.e. increased vulnerability or reduced capacity to cope – probably because of poor governance and low GDP), however a high magnitude event together with secondary hazards can cause considerable more damage to communities, therefore an overall final judgement might comment on the ability of a society to withstand certain levels of magnitude events.	
Level	**Mark**	**Descriptor**
	0	No rewardable material.
Level 1	**1–4**	• Demonstrates isolated elements of geographical knowledge and understanding, some of which may be inaccurate or irrelevant. (AO1) • Applies knowledge and understanding of geographical information/ideas, making limited logical connections/relationships. (AO2) • Applies knowledge and understanding of geographical information/ideas to produce an interpretation with limited relevance and/or support. (AO2) • Applies knowledge and understanding of geographical information/ideas to make unsupported or generic judgments about the significance of few factors, leading to an argument is unbalanced or lacks coherence. (AO2)
Level 2	**5–8**	• Demonstrates geographical knowledge and understanding, which is mostly relevant and may include some inaccuracies. (AO1) • Applies knowledge and understanding of geographical information/ideas logically, making some relevant connections/relationships. (AO2) • Applies knowledge and understanding of geographical information/ideas to produce a partial but coherent interpretation that is mostly relevant and supported by evidence. (AO2) • Applies knowledge and understanding of geographical information/ideas to make judgments about the significance of some factors, to produce an argument that may be unbalanced or partially coherent. (AO2)
Level 3	**9–12**	• Demonstrates accurate and relevant geographical knowledge and understanding throughout. (AO1)

Question number	Answer.	
		• Applies knowledge and understanding of geographical information/ideas logically, making relevant connections/relationships. (AO2) • Applies knowledge and understanding of geographical information/ideas to produce a full and coherent interpretation that is relevant and supported by evidence. (AO2) • Applies knowledge and understanding of geographical information/ideas to make supported judgments about the significance of factors throughout the response, leading to a balanced and coherent argument. (AO2)

Question number	Answer	Mark
2(a)	**AO1 (1 mark)** Award **1** mark for a correctly identified process glacial movement: • Basal slip ❶ • (Regelation) creep ❶ • Internal deformation / Intergranular flow ❶. • Sliding ❶ • Avalanche ❶ Allow any other reasonable response.	(1)

Question number	Answer	Mark
2 (b) (i)	**AO3 (2 marks)** Allow up to **2** marks for correctly describing the direction of glacial flow. • The main glacier flows from top to bottom of the photograph / from NE to SW ❶. • Tributary glaciers join the valley glacier from the W/NW / initially flowing E ❶ and continue to flow SW down the valley ❶. Accept the glacier is flowing to the south. Do not accept flow to the south east. Accept any other appropriate response.	(2)

Question number	Answer	Mark
2(b)(ii)	**AO1 (2 marks)/AO2 (1 mark)** Award **1** mark for suggesting a reason for the pattern of moraine with a further **2** extension marks to explain why glacial processes has caused that pattern: • Two tributary glaciers have eroded their valley sides / created their own lateral moraines ❶ so when two glaciers meet / a tributary glacier meets the main glacier trunk ❶ the combination of two lateral moraines joins up to form medial moraine / stripes that are parallel to the glacier flow. ❶ • When two glaciers meet / a tributary glacier meets the main glacier trunk ❶ so stripes of moraine are joined up medial moraine ❶ formed by the combination of two lateral moraines / two tributary glaciers have eroded their valley sides ❶. • The stripes of moraine flow parallel to the glacier flow ❶. because glaciers are extremely effective agents of erosion / transporters of material ❶ and deposit lateral moraine at the sides where energy is lowest ❶. Accept any other appropriate response.	(3)

Question number	Answer	Mark
2(c)	**AO1 (4 marks)** For each landform, award **1** mark for beginning to explain how the periglacial landform forms and a further mark expansion continuing to explain how this happens, up to a maximum **2** marks each. For example: • Ice wedges occur when ice occurs in cracks in the permafrost ❶ which form because of shrinking in the volume of ice within the soil when it cools in winter ❶ • Patterned ground is caused by frost heave ❶ and stones to move upward to the surface / sediments freeze-thaw at different rates / action on slopes to cause solifluction / down-freezing of the active layer in the autumn ❶ • Scree slopes are caused by debris / rocks falling from the sides of mountains ❶ because freeze-thaw and other erosion processes have caused the rock to weaken ❶. • Pingos are small hills that have domed upwards because of ice growth ❶ because surface water has penetrated the ground and is stored in the sediment / the downward movement of permafrost into previously unfrozen ground ❶. • Tors are mounds of rock left free-standing ❶ left after the surrounding blockfield / slopes have moved away because of solifluction ❶. • Blockfields are extensive areas of angular rock ❶ after freeze-thaw action has broken down exposed rock ❶. • Solifluction lobes form when permafrost thaws ❶ and the saturated / active layer starts to flow downhill ❶. • Loess is silt blown by the wind ❶ originally produced by glaciers eroding and depositing material in inland highland areas ❶. Accept any other reasonable response.	**(4)**

Question number	Answer
2(d)	**AO1 (6 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the levels-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. Relevant points may include: • Stakeholders help conserve and protect landscapes (e.g. Friends of the Lake District) and include conservationists, NGOs (e.g. Greenpeace), scientists (e.g. BAS) local and regional government, and global organisations. There are a spectrum of approaches ranging from 'full conservation', 'sustainable management' and 'do nothing' • Legislative frameworks and comprehensive protection (e.g. Alpine Convention) might help some stakeholders see the environment as sacred / easily disrupted / essential for their– but prevent other groups who depend on glaciated landscapes • Antarctica's uniqueness requires appropriate response based on internationally agreed values / no resident population. The Treaty + Annexe restricts occupation/use so far - reducing the opportunity for economic use, instead more for research, education but there is increasingly a tourist use. • Sustainable management strategies can reduce exploitation of the environment (less walkers, fewer dams etc), however they can threaten economic prosperity in remote mountainous landscapes that might depend on exploitation for survival (e.g. the winter ski season) • Sustainable management strategies might include the use of technology, e.g. oil pipelines, satellite imagery, building design, artificial snow cannons), however these still require specialist stakeholders to be appropriate, and some technology might be more intermediate than others (e.g. skidoos, GPS systems in the Nunavut region) • Do nothing might allow human activity to exploit the landscape, but degrade the ecology, e.g. soil erosion / landslides / avalanches – which in turn might threaten the viability of agriculture particularly in fragile, marginal environments. • Global action to mitigate against climate change, might be too late to support people affected by relict areas where small-scale conservation might be more appropriate. Allow other reasonable explanations.

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	**1–2**	• Demonstrates isolated elements of geographical knowledge and understanding, some of which may be inaccurate or irrelevant. (AO1) • Understanding addresses a narrow range of geographical ideas, which lack detail. (AO1)
Level 2	**3–4**	• Demonstrates geographical knowledge and understanding, which is mostly relevant and may include some inaccuracies. (AO1) • Understanding addresses a range of geographical ideas, which are not fully detailed and/or developed. (AO1)
Level 3	**5–6**	• Demonstrates accurate and relevant geographical knowledge and understanding throughout. (AO1) • Understanding addresses a broad range of geographical ideas, which are detailed and fully developed. (AO1)

Question number	Answer
2(e)	**AO1 (3 marks)/AO2 (9 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the levels-based mark scheme below. Responses that demonstrate **only** AO1 without any AO2 should be awarded marks as follows: • Level 1 AO1 performance: 1 mark • Level 2 AO1 performance: 2 marks • Level 3 AO1 performance: 3 marks. **Indicative content guidance** The indicative content below is not prescriptive and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. Relevant points may include: **AO1** • Glacial erosion processes include abrasion, quarrying, plucking, crushing, basal melting • Glacial deposition occurs because glaciers melt and drop any material previously eroded, or carried as a result of weathering. • Distinctive means a unique combination of landforms that together make up a landscape. • Glacial landscapes are often characterised by cirque and valley glaciers (cirques / corries, aretes, pyramidal peaks glacial troughs, truncated spurs and ribbon lakes), but also might include ice sheet scour landforms (roches moutonnees, knock and lochan, crag and tail). • Role implies other processes are involved – e.g. glacial deposition processes and glacial meltwater. **AO2** **Glacial deposition processes are important because** • Change in local climate means deposition is important – e.g. englacial and supraglacial and subglacial material is deposited in valleys – e.g. till, boulder clay, erratics, as well as terminal and recessional moraine. On the other hand, this material is the by-product of glacial erosion. • Drumlins are the by-product of glacial deposition, BY their distinctive shape is the by produce of erosion in the direction of ice movement. • fluvioglacial is now also important, resulting in kames and eskers, however again, these are the by-product of rivers sorting material that was originally eroded by glaciers. • Some landforms are the by-product of water flow in today's warmer climate, e.g. hanging valleys. However, they are only exist because of tributary valley glaciers eroding in the past.

Question number	Answer	
	Distinctive landscapes are also the by-product of other factors and the importance of glacial deposition might necessitate the presence of other processes (e.g. erosional) in relict landscapes • Landscapes are the by-product of ice contact with surrounding rock both beneath and on the sides of a glacier – abrasion can leave striations on surrounding rock. Equally, this eroded material is later deposited as silt/clay (rock flour) • Plucking is also the result of ice contact, and largest particulates of rocks can be detached by the glacier – likewise, this material can be later deposited on the valley floor in apparently random geological locations (erratics). • Glacial erosion is particularly strong as ice accumulates and begins to rotate, e.g. in hollows where strongest erosion will be at the back and bottom, leading to cirques/corries, aretes. Equally, high levels of ice pressure help the formation of subglacial meltwater valleys which carry coarse debris to wear down bedrock beneath a glacier • Glacial erosion depends on rate and amount of ice flow, e.g. hanging valleys are left by tributary glaciers, fast moving ice flow. Glacial erosion in active landscapes is also the by-product of mass-balance in favour of accumulation, i.e. the glacier has sufficient energy to erode, e.g. high altitude, low-altitude environments. • A combination of erosion and deposition explains the developed of moraine lakes, e.g. Lake Garda in the Italian Alps. **There are other factors that control the type of glacial erosion** • Differential geology in the valley floor can mean landforms are shaped more by ice sheet scouring, e.g. limestone landscapes of northern England / western Ireland – this results in (perhaps relict) landscapes dominated by roches moutonnees, crag and tail and knock-and-lochan topography • Often north-facing slopes (in the northern hemisphere) receive less insolation from the sun, and this helps glaciers to grow larger, and cause more erosion, e.g. cirques are often orientated between north-west and south-east. • Glacial surges (up to 350m of flow a day) can sometimes occur if accumulation is high enough for a long period of time and the angle is increasingly steep and water build up underneath the glacier is released, resulting in rapid sliding. Judgements might be based around whether glacial deposition is the most important factor. Some candidates might note that other erosion remains the most important in active landscapes yet in relict landscapes other processes have become more important Others will probably comment on how deposition is most useful for determining provenance. Most are therefore likely to judge that erosion is the most important – although the very best might comment that there are other factors that affect the amount and speed of glacial erosion and deposition.	
Level	**Mark**	**Descriptor**

Question number	Answer	
	0	No rewardable material.
Level 1	**1–4**	• Demonstrates isolated elements of geographical knowledge and understanding, some of which may be inaccurate or irrelevant. (AO1) • Applies knowledge and understanding of geographical information/ideas, making limited logical connections/relationships. (AO2) • Applies knowledge and understanding of geographical information/ideas to produce an interpretation with limited relevance and/or support. (AO2) • Applies knowledge and understanding of geographical information/ideas to make unsupported or generic judgments about the significance of few factors, leading to an argument is unbalanced or lacks coherence. (AO2)
Level 2	**5–8**	• Demonstrates geographical knowledge and understanding, which is mostly relevant and may include some inaccuracies. (AO1) • Applies knowledge and understanding of geographical information/ideas logically, making some relevant connections/relationships. (AO2) • Applies knowledge and understanding of geographical information/ideas to produce a partial but coherent interpretation that is mostly relevant and supported by evidence. (AO2) • Applies knowledge and understanding of geographical information/ideas to make judgments about the significance of some factors, to produce an argument that may be unbalanced or partially coherent. (AO2)
Level 3	**9–12**	• Demonstrates accurate and relevant geographical knowledge and understanding throughout. (AO1) • Applies knowledge and understanding of geographical information/ideas logically, making relevant connections/relationships. (AO2) • Applies knowledge and understanding of geographical information/ideas to produce a full and coherent interpretation that is relevant and supported by evidence. (AO2) • Applies knowledge and understanding of geographical information/ideas to make supported judgments about the significance of factors throughout the response, leading to a balanced and coherent argument. (AO2)

Question number	Answer
3	**AO1 (4 marks)/AO2 (12 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the levels-based mark scheme below. Responses that demonstrate **only** AO1 without any AO2 should be awarded marks as follows: • Level 1 AO1 performance: 1 mark • Level 2 AO1 performance: 2 marks • Level 3 AO1 performance: 3 marks • Level 4 AO1 performance: 4 marks **Indicative content guidance** The indicative content below is not prescriptive and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. Relevant points may include: **AO1** • Glaciated landscapes face threats from natural hazards (glacial outburst floods) and human activity (leisure and tourism, urbanisation) • Human activity can degrade the landscape and fragile ecology of glaciated landscapes, e.g. soil erosion, trampling) • Active glaciated landscapes have environmental and cultural value, e.g. polar scientific research, wilderness recreation. • Glaciated landscapes can have a unique biodiversity and play an important role in maintain natural systems. • The location of volcanoes is associated with plate boundaries, and they cause lava flows, pyroclastic flows, ash falls, gas eruptions and cause other secondary hazards. **AO2** **People are the main threat** • Human activity is a further threat – e.g. to ecology (Fig 4a) with tourist numbers and activities continuing to grow/expand (Fig. 4c) • Human activity is linked to anthropogenic climate change (1) with the associated knock-on effects to glaciers which seem to be melting, and this might cause further threats (e.g. sea-level rise) – some students might note this process could trigger a albedo-related positive feedback loop - equally some research suggests mass-balance is increasing. **People are not the only main threat** • Ice-melt and the consequent impact on global sea-levels and albedo might be seen as the most important threat, although it might be argued that human activity beyond Antarctica is responsible for these changes. • There are a string of 91 volcanoes that have been discovered (Fig 4a) and their pattern seems to coincide with increased velocity of glacial flow (Fig

Question number	Answer
	4b). On the other hand, volcanic eruptions can sometimes cause planetary cooling, which would have the potential to slow down glacial flow. • Glacial flow is speeding up naturally, under its own weight (Fig 4a), so it is hard to attribute change to underground heating – particularly as flow velocity is also higher towards the coastline (Fig 4b) • Bedrock heat from volcanic activity could cause subglacial melting, including the frozen streams, which could lubricate glacial flow (Fig 4a) • Some candidates might note that volcanic ash could change the albedo – dark ash absorbing incoming solar radiation could accelerate glacial melt. **People are threatened / People can act to prevent** • A rise in global sea-level might threaten infrastructure on low-lying parts of Antarctica, e.g. Penguin Post Office (Fig. 4d), and the ecology of fragile habitats (Fig. 4d) • Antarctica's nature as a wilderness area attracts tourists, but the extreme nature of the tourism means protection measures are in place to limit the damage (e.g. Fig. 4d) • Increasing human activity to Antarctica includes scientists, whose research stations will help to understand the nature of volcanic activity and glacial flow (Fig 4d). Judgements and conclusions might be based around whether tourism or tectonics are the more serious threat to Antarctica's wilderness landscapes, rather than people – although ice melt might be viewed by many as the most imminent and globally significant threat. Ultimately, the tourist threat is probably more serious however this means management strategies are more effective. In contrast, the tectonic hazards are more serious long-term and there is no easy management strategy. Most are likely to conclude that the volcanoes pose the bigger threat overall, depending on how much consideration is given to management.

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	**1–4**	• Demonstrates isolated elements of geographical knowledge and understanding, some of which may be inaccurate or irrelevant. (AO1) • Applies knowledge and understanding of geographical information/ideas, making limited and rarely logical connections/relationships, to produce an interpretation with limited relevance and/or support. (AO2) • Applies knowledge and understanding of geographical information/ideas to produce an unsupported or generic conclusion, drawn from an argument that is unbalanced or lacks coherence. (AO2) • Limited synthesis of geographical ideas from across the course of study. (AO2)
Level 2	**5–8**	• Demonstrates geographical knowledge and understanding, which is occasionally relevant and may include some inaccuracies. (AO1) • Applies knowledge and understanding of geographical information/ideas with limited but logical connections/relationships to produce a partial interpretation that is supported by some evidence but has limited coherence. (AO2) • Applies knowledge and understanding of geographical information/ideas to come to a conclusion, partially supported by an unbalanced argument with limited coherence. (AO2) • Argument partially synthesises some geographical ideas from across the course of study, but lacks meaningful connections. (AO2)
Level 3	**9–12**	• Demonstrates geographical knowledge and understanding, which is mostly relevant and accurate. (AO1) • Applies knowledge and understanding of geographical information/ideas to find some logical and relevant connections/relationships to produce a partial but coherent interpretation that is supported by some evidence. (AO2) • Applies knowledge and understanding of geographical information/ideas to come to a conclusion, largely supported by an argument that may be unbalanced or partially coherent. (AO2) • Argument synthesises some geographical ideas from across the course of study, making some meaningful connections. (AO2)
Level 4	**13–16**	• Demonstrates accurate and relevant geographical knowledge and understanding throughout. (AO1) • Applies knowledge and understanding of geographical information/ideas to find fully logical and relevant

		connections/relationships to produce a full and coherent interpretation that is supported by evidence. (AO2) • Applies knowledge and understanding of geographical information/ideas to come to a rational, substantiated conclusion, fully supported by a balanced argument that is drawn together coherently. (AO2) • Argument comprehensively and meaningfully synthesises geographical ideas from across the course of study throughout the response. (AO2)

Question number	Answer	Mark
4(a)	**AO1 (1 mark)** Award **1** mark for a correct identifying part of the littoral zone: • Offshore ❶ • Nearshore ❶ • Foreshore ❶ • Backshore ❶ Accept any other reasonable response.	(1)

Question number	Answer	Mark
4(b)(i)	**AO3 (2 marks)** Allow up to **2** marks for correctly describing the direction of sediment transport. • Sediment is transported from south / southeast to north / northwest / point A to point B / up the beach ❶. • Sediment is transported parallel to the sea ❶ from east to west / left to right on the photo ❶. • Sediment movement is stopped by / builds up around the groyne ❶. Accept comments about the **direction** of swash / backwash (at 90°) Do not accept explanations of movement, e.g. longshore drift. Accept any other reasonable response.	(2)

Question number	Answer	Mark
4 (b)(ii)	**AO1 (2 marks)/AO2 (1 mark)** Award **1** mark for suggesting a reason for the different size of material along the transect and **2** extension marks to explain how those processes might have operated: • The waves are constructive so strong swash / weaker backwash ❶ sorting sediment by leaving larger sediment up the beach / further inland ❶ while only smaller material can be transported back to the sea ❶. • There is more wave / water contact closer to A / waves don't reach B so often ❶ so marine erosion processes are more active ❶ making sediment smaller / removing the larger sediment by longshore drift ❶. • The groyne interferes with longshore drift ❶ so the replacement of larger sediment is limited ❶ leaving a smaller beach / with a wider range of sediment overall ❶. • Occasional destructive / storm / stronger / winter waves ❶ because higher energy waves can transport larger sediment ❶ . might have deposited larger material further up the beach / further inland ❶ . • Water percolated through the larger sediment ❶ absorbing the energy of the backwash / creating a weaker backwash ❶ so only smaller material is transported back down the beach / the beach is relatively steep ❶. Accept any other appropriate response.	**(3)**

Question number	Answer	Mark
4(c)	**AO1 (4 marks)** For each characteristic, award **one** mark for beginning to explain how a characteristic of a submergent coastline forms and a further mark expansion continuing to explain how this happens up to a maximum **2** marks each. For example: • Rias / estuaries are drowned river valleys because of isostatic / eustatic sea-level change ❶ because of isostatic readjustment / global climate change ❶. • Fjords are glacial valleys drowned by isostatic / eustatic sea level rise ❶ because of global climate change / a glacier has eroded an inlet close to the sea / to an altitude below current sea-level ❶. • Dalmatian coasts are elongated islands submerged by the sea ❶ because of a series of parallel fold structures along the coastline ❶. • Marine transgression is causing shingle ridges to move inland ❶ because of post-glacial adjustment / isostatic sea-level rise ❶. Accept any other reasonable responses.	**(4)**

Question number	Answer
4(d)	**AO1 (6 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the levels-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. Relevant points may include: • Policy decisions at coastlines range from 'No Active Intervention', 'Strategic Realignment' to 'Hold the Line' and 'Advance the Line'. Hard and soft engineering are other ways to understand decisions made at coastlines – but they will be part of policy decisions. • 'No active intervention' might create conflict with those suffering from the effects of coastal retreat - economic losses (housing, businesses, agricultural land, infrastructure) and social losses (relocation, loss of livelihood, amenity value). Businesses, farmers might be in a position to take action (e.g. strategic realignment), but this involves temporary economic loss and sometimes accepting of 'no intervention' can be more appropriate. • Appropriate ways to manage risk to potential infrastructure (e.g. trunk roads which provide access) 'Hold the Line' leads to the construction of defences that can harm business in the short-term and might require capital investment by local authorities. Long-term protection can yield a better economic outcome (e.g. Lyme Regis growth in tourism post sea-defence work). • Appropriate coastal management decisions must involve a shoreline management plan so that the needs of all players, as well as littoral cell processes are considered – e.g. Slapton Sands. Otherwise conflict will be an issue as intervention has knock-on effect downdrift, e.g. Holderness coastline. Therefore strategic realignment requires specialist stakeholders who understand principles of ICZM and littoral drift and sediment cells. • Sustainable management strategies can be appropriate ways to reduce exploitation of the environment (less construction at beach resorts etc), however they can be inappropriate in remote rural coastal locations, that might depend on tourism for survival (e.g. the summer surf / beach season). • Sustainable management might also cause conflict between different local, national and global players (e.g. Jurassic Coast, conservationists, NGOs, British Geological Society) as reducing visual impact of engineering might increase the number of visitors to a sustainably managed coastline. Accept any other reasonable response. If no example named, the answer is unlikely to go out of level 2.

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	**1–2**	• Demonstrates isolated elements of geographical knowledge and understanding, some of which may be inaccurate or irrelevant. (AO1) • Understanding addresses a narrow range of geographical ideas, which lack detail. (AO1)
Level 2	**3–4**	• Demonstrates geographical knowledge and understanding, which is mostly relevant and may include some inaccuracies. (AO1) • Understanding addresses a range of geographical ideas, which are not fully detailed and/or developed. (AO1)
Level 3	**5–6**	• Demonstrates accurate and relevant geographical knowledge and understanding throughout. (AO1) • Understanding addresses a broad range of geographical ideas, which are detailed and fully developed. (AO1)

Question number	Answer
4(e)	**AO1 (3 marks)/AO2 (9 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the levels-based mark scheme below. Responses that demonstrate **only** AO1 without any AO2 should be awarded marks as follows: • Level 1 AO1 performance: 1 mark • Level 2 AO1 performance: 2 marks • Level 3 AO1 performance: 3 marks. **Indicative content guidance** The indicative content below is not prescriptive and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. Relevant points may include: **AO1** • Coastal transport and deposition processes are influenced by the angle of wave attack, tides and currents – and the main process is longshore drift. • Distinctive coastal landforms formed by deposition include beaches, recurved and double spits, offshore bars, barrier beaches and bars, tombolos and cuspate forelands. • Distinctive coastal landforms formed by erosion include wave cut notches, wave cut platforms, cliffs, the cave-arch-stack-stump sequence. • Other examples of deposition include the formation of sand dune succession on sandy coastlines and salt marsh successional in estuarine areas. Accept details of the role of Aeolian transport in the formation of sand dunes. • Coastal erosion processes include hydraulic action, corrosion, abrasion and attrition – and these are affected by wave type, size and lithology. • Erosion creates distinctive coastal landforms – e.g. wave cut notches, wave cut platforms, cliffs, the cave-arch-stack-stump sequences. **AO2** **Transport and Deposition processes play a more important role** • Beaches are clearly an accumulation of deposited sediment which is reworked by the action of waves and tides. However, distinctive landforms might include berms if the transport and subsequent deposition of sediment is further up the beach during high tide • Spits are long, narrow ridges of sand and/or shingle, created by longshore drift to extend partly across an estuary. However, salt marshes often develop behind the spit and sand dune succession is key for their stabilisation. • If longshore drift elongates the spit across the river channel bars (baymouth bars) are formed creating a lagoon behind the bar. However, some bars are formed when rising sea levels associated with the end of

Question number	Answer
	the last ice age have pushed sediment landwards and trapped a freshwater lagoon e.g. Slapton sands. • Cuspate forelands are thought to be formed when longshore drift occurs in opposite directions with sediment merging into a triangular protrusion e.g. Dungeness in Kent. • Double spits are formed due to dominant directions of wind creating spits either side of a harbour (e.g. Chichester) – however it's the daily action of the tide that erodes away any deposits or the supply of sediment is not great enough to create a bar. **Erosion processes play a more important role** • Location of the coastline influences the amount of erosion that would occurs, e.g. exposure to prevailing wind (e.g. fetch), tidal range (low range increases chance of erosion), and rock type (soft rock is less likely to resist erosion). • Spits / bars can only form if there a surplus of surplus of eroded sediment for longshore to transport – they also require change in direction of the coast, perhaps at a headland / bay, which reflects erosion due to geological arrangement. • The Sediment Cell concept is a reflect of erosion providing material (source), and then transported and deposited – however open systems can gain material (erosion) or lose material (deposition). In closed systems, it might be considered that erosion and deposition are equally balanced, i.e. dynamic equilibrium. On the other hand, dynamic equilibrium can be disturbed by long-term changes, e.g. sea-level rise brings waves in more direct contact with the cliff again. • Equally a poor supply of sediment can prevent a bar being formed, e.g. double spit. On the other hand, some double spits can form if bars are breached – e.g. Bembridge Harbour (Isle of Wight) • Erosional landforms are clearly the by-product of erosional processes, e.g. mass movement at the base of a cliff. However, material is deposited at the base of cliffs / forms beaches. This material can absorb wave energy and can temporarily protect cliffs from further erosion. **There are other factors that create a distinctive landscape**, • Sediment is thrown by swash during extreme conditions and thus, is above the level of high spring tides. • River flows in estuaries are important factor preventing a spit/recurved spit from becoming a barrier beach / bar. • Tombolos are beaches / bars that connect two landmasses - formed when an offshore island refracts approaching waves so that there is then a convergence of two directions of longshore drift – e.g. St Ninian's Isle Tombolo. • Systems that find themselves in dynamic equilibrium are often the result of a balance between erosion and transport – but this can be disturbed by external influences, e.g. sea-level rise.

Question number	Answer
	Accept both micro and macro forms of sediment transport such as solution, saltation, traction, gravity settling as well as longshore drift and overwashing. Judgements might be based around whether sediment transport/deposition is significantly more important than erosion. Some candidates might reflect on other factors that influence the rate of these processes and conclude that these are more important (e.g. constructive/destructive waves / sea-level / tides). However, most are likely to conclude that deposition and transport of sediment is only possible because of previous erosion within a sediment cell.

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	**1–4**	• Demonstrates isolated elements of geographical knowledge and understanding, some of which may be inaccurate or irrelevant. (AO1) • Applies knowledge and understanding of geographical information/ideas, making limited logical connections/relationships. (AO2) • Applies knowledge and understanding of geographical information/ideas to produce an interpretation with limited relevance and/or support. (AO2) • Applies knowledge and understanding of geographical information/ideas to make unsupported or generic judgements about the significance of few factors, leading to an argument is unbalanced or lacks coherence. (AO2)
Level 2	**5–8**	• Demonstrates geographical knowledge and understanding, which is mostly relevant and may include some inaccuracies. (AO1) • Applies knowledge and understanding of geographical information/ideas logically, making some relevant connections/relationships. (AO2) • Applies knowledge and understanding of geographical information/ideas to produce a partial but coherent interpretation that is mostly relevant and supported by evidence. (AO2) • Applies knowledge and understanding of geographical information/ideas to make judgements about the significance of some factors, to produce an argument that may be unbalanced or partially coherent. (AO2)
Level 3	**9–12**	• Demonstrates accurate and relevant geographical knowledge and understanding throughout. (AO1) • Applies knowledge and understanding of geographical information/ideas logically, making relevant connections/relationships. (AO2)

		• Applies knowledge and understanding of geographical information/ideas to produce a full and coherent interpretation that is relevant and supported by evidence. (AO2) • Applies knowledge and understanding of geographical information/ideas to make supported judgements about the significance of factors throughout the response, leading to a balanced and coherent argument. (AO2)

Question number	Answer
5	**AO1 (4 marks)/AO2 (12 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the levels-based mark scheme below. Responses that demonstrate **only** AO1 without any AO2 should be awarded marks as follows: • Level 1 AO1 performance: 1 mark • Level 2 AO1 performance: 2 marks • Level 3 AO1 performance: 3 marks • Level 4 AO1 performance: 4 marks **Indicative content guidance** The indicative content below is not prescriptive and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. Relevant points may include: **AO1** • Sea-level change influences coasts – both eustatic and isostatic sea-level rise from post glacial adjustment and tectonics. • Economic losses (housing, businesses, agricultural land, infrastructure) and social losses (relocation, loss of livelihood, amenity value) can be significant, especially in areas of dense coastal developments. • Rates of recession are not constant and are influenced by different factors, both short- and longer- term (wind direction / fetch, tides, seasons, weather systems and occurrence of storms). • Subaerial processes (Weathering and mass movement) work together to influence rates of coastal recession • The location of volcanoes is associated with plate boundaries, and they cause lava flows, pyroclastic flows, ash falls, gas eruptions and cause other secondary hazards. • Prediction and forecasting accuracy depend on the type and location of the tectonic hazard). **AO2** **Human activity is the main threat** • Tourism is growing exponentially (Fig. 4c), but this seems linked to the volcanic eruption of Eyjafjallajokull in 2010, and perhaps reflects a laissez-faire attitude to the dangers in nature by tourists (Fig 4d, Fig 4a) • The hazard management risk is well understood by local scientists and local population, but not by tourists (Fig. 4a), and tourists considerably outnumber the local population, creating a greater risk. • The increase in popularity as a film location (Fig 4b) is leading to a greater change of damage / erosion to the landscape (Fig. 4a) – but barren wilderness makes it ideal for even more filming.

Question number	Answer
	Human activity is not the only main threat • The coastline is very dangerous, because of the exposed fetch / strong waves, active erosion (Fig 4a). Equally the island is only exposed in the Atlantic Ocean because it is part of the mid-Atlantic ridge. • Complex cliff profiles, heavily jointed, lichen filled rocks exploited by storm waves create ideal conditions for different types of rock breakdown (Fig 4d) – equally the heavily jointed basalt columns are the result of volcanic lava flow. • The threat from the volcano is exacerbated by the proximity to glaciers, which then burst, with river flooding causing further problems along the coast (Fig 4a) – however the consequence of local sea-level rise is likely to affect tourist infrastructure, many hotspots are located along the coast (Fig. 4b). **Iceland's landscape serves other purposes** • Iceland is tectonically active, and the threat is persistent (Fig 4a) – the next expected eruption (Katla) is very near tourist hotspots along the Golden Circle (Fig 4a) • Increasing human activity to Antarctica includes film studios – and this could represent an alternative source of income so the country doesn't depend so much on tourists – and the unique of the landscape depends on volcanic activity (Fig 4a) • The increased income from tourism is heavily linked to the volcanic activity (Fig 4a) – arguably the country depends on volcanic activity (Fig. 4b), but tourism seems confined to coastal areas where tourists are vulnerable to both coastal (Fig 4d) and volcanic dangers (Fig. 4b). Judgements and conclusions might be based around whether tourism or tectonics are the more serious threat to Iceland's coastal landscape. Ultimately, the tectonic threat is probably more serious however this means management strategies are more effective. In contrast, the tourism hazards are more serious on a year-year basis there is no easy management strategy since the economy depends on tourism. Most are likely to conclude that the tourists are most <u>at</u> risk from both coastal and tectonic processes and pose the bigger challenge overall.

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	**1–4**	• Demonstrates isolated elements of geographical knowledge and understanding, some of which may be inaccurate or irrelevant. (AO1) • Applies knowledge and understanding of geographical information/ideas, making limited and rarely logical connections/relationships, to produce an interpretation with limited relevance and/or support. (AO2) • Applies knowledge and understanding of geographical information/ideas to produce an unsupported or generic conclusion, drawn from an argument that is unbalanced or lacks coherence. (AO2) • Limited synthesis of geographical ideas from across the course of study. (AO2)
Level 2	**5–8**	• Demonstrates geographical knowledge and understanding, which is occasionally relevant and may include some inaccuracies. (AO1) • Applies knowledge and understanding of geographical information/ideas with limited but logical connections/relationships to produce a partial interpretation that is supported by some evidence but has limited coherence. (AO2) • Applies knowledge and understanding of geographical information/ideas to come to a conclusion, partially supported by an unbalanced argument with limited coherence. (AO2) • Argument partially synthesises some geographical ideas from across the course of study, but lacks meaningful connections. (AO2)
Level 3	**9–12**	• Demonstrates geographical knowledge and understanding, which is mostly relevant and accurate. (AO1) • Applies knowledge and understanding of geographical information/ideas to find some logical and relevant connections/relationships to produce a partial but coherent interpretation that is supported by some evidence. (AO2) • Applies knowledge and understanding of geographical information/ideas to come to a conclusion, largely supported by an argument that may be unbalanced or partially coherent. (AO2) • Argument synthesises some geographical ideas from across the course of study, making some meaningful connections. (AO2)
Level 4	**13–16**	• Demonstrates accurate and relevant geographical knowledge and understanding throughout. (AO1) • Applies knowledge and understanding of geographical information/ideas to find fully logical and relevant

		connections/relationships to produce a full and coherent interpretation that is supported by evidence. (AO2) • Applies knowledge and understanding of geographical information/ideas to come to a rational, substantiated conclusion, fully supported by a balanced argument that is drawn together coherently. (AO2) • Argument comprehensively and meaningfully synthesises geographical ideas from across the course of study throughout the response. (AO2)