Mark Scheme (Results)

Summer 2024

Pearson Edexcel GCE
In Geography (8GE0)
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.

Paper 1 Mark scheme (Initial Draft)

Question number	Complete the missing part of the hazard risk equation. Answer	Mark
1(a)	**AO1 (1 mark)** Award **1 mark** for the correctly named part: • Capacity to cope ❶ • Resilience ❶ Allow other acceptable answers	(1)

Question number	Compare the differences in the distribution of aftershocks. Answer	Mark
1(b)(i)	**AO3 (2 marks)** Award **1 mark** for each correct described comparison: • They are **more** concentrated in August / 2021 / they are more scattered in January / 2010 ❶. • There are **less offshore** aftershocks in August / 2021 ❶. • There are **less** aftershocks in August / 2021 ❶. • They have generally shifted **west / mainly affect Jeremie** in August / 2021 ❶. • There are **less north of the Faultline** in August / 2021 ❶. Accept any other correct description based on figure 1.	(2)

Question number	Suggest one reason for the pattern of aftershocks shown in 2021.	Mark

	Answer	
1(b)(ii)	**AO1 (2 marks)/AO2 (1 mark)** Award **1** mark for analysing the resource to suggest a reason for the pattern, and a further **2** marks for justifying the possible reason, for example: • People are nearer to a faultline where an earthquake occurred / the magnitude of the 2021 earthquake is slightly higher / the 2021 focus might be deeper / the focus might be deeper ❶ so the previous release of stress might have caused stress to build up in / be transferred to smaller faults / earthquake waves have to travel further ❶, and then be released / the rock might be fractured relieving that stress / there will be less energy at the surface ❶. • The population in 2021 might be more prepared / ready / waiting for EQ to occur / have better seismic technology / more citizen science to detect the initial EQ / the Faultline was better understood ❶ so have practiced evacuation / moved to areas away from the 2010 epicentre / built stronger houses / rebuilt infrastructure to withstand seismic events ❶ so less aftershocks were detected ❶. • The earthquake in 2021 was further from the capital city / Port au Prince so population density might have been lower ❶ so less aftershocks were detected ❶ because there were less people experiencing them / seismic monitoring networks were concentrated ❶. Accept any other appropriate response based on figure 1.	**(3)**

Question number	**Explain two hazards caused by volcanoes.** **Answer**	**Mark**

1(c)	**AO1 (4 marks)** For each volcanic hazard, award **1** mark for explaining the hazard and a further **1** mark for developing why it is a hazard for people, for example: • Lava flow are streams of molten rock that flow from a volcanic event ❶ which burn / set fire to anything in its path / the viscosity and speed of which depends on the type of volcano eruption ❶. • Pyroclastic flow / Nuée ardentes are caused by a very explosive eruption / the eruption column itself collapses and can't continue to rise / when material 'boils over' from eruption vent / lava domes collapse because of gravity ❶ and fiery hot pyroclastic material surges down the slopes causing damage to nearby settlements / vegetation ❶. • Tephra / ash are tiny particles of rock and natural glass / tephra bombs blasted into the air by a volcanic eruption ❶ which can be transported by wind thousands of miles / land on buildings causing damage / causing respiratory issues if inhaled / electrostatic charging created by the upward movement of ash can help trigger thunderstorms / which in turn can trigger lahars ❶ • Gas eruptions occur when magma contains dissolved gasses / dissolved gases are released from liquid magma ❶ because of pressure decreases when they reach the surface / released into the atmosphere ❶. • Lahars are caused by rain mixing with either ash on the steep side of a volcano ❶ creating a great mudflow (e.g. Java) ❶. • Jokulhlaups / mudflows occur when the volcano beneath an ice cap / glacier erupts ❶, / subsequently bursting out from the ice cap / causing mass flooding / surging across the outwash plain surrounding the ice cap ❶. Accept any other appropriate response. Note that, on some occasions, rising magma can causes earthquakes. Do not accept responses that could simply refer to tectonic disasters.	**(4)**

Question number	Explain the global distribution of earthquake hazards. 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: • The earth's crust is made up of a set of plates (and platelets) that rest on the asthenosphere – and these plates move, either spreading apart or converging. • When two plates do not come directly into collision, they slide past each other along a fault. The movement is irregular, so tension builds up which is then released, causing an earthquake. • Earthquake activity can shape the patterns of human activity – e.g. attracting or putting off people from living in certain locations. The extent of human activity determines the level of social and economic vulnerability, i.e. hazard. • Locations with high density / low-income populations will be impacted more severely by earthquakes. • Where plates converge subduction of crust materials leads to partial melting and slab pull. These processes do not occur smoothly, resulting in earthquakes. • Earthquakes form along lines that are often formed by mid-ocean ridges of major mountain chains – where the earth is moving and under stress. • Part of the Earth's land surface is characterised by active areas of mountain building – either because of volcanism or the bending of earth's crust by other tectonic activity – which over time, can result in earthquakes. • Tectonics and volcanism can combine to produce mountain ranges – with steep slopes that are vulnerable to landslides when triggered by earthquakes, e.g. the Alps / Himalayas. For L3, 'broad range' does not require an explanation of all the ideas outlined above.

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	**Assess the idea that the most severe volcanic disasters only occur on destructive plate boundaries.** **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** • Volcanoes are associated with hotspots from mantle plumes, as well as different plate margins (destructive and constructive). • Volcanoes caused lava flows, pyroclastic flows, ash falls, gas eruptions, and secondary hazards (lahars, jokulhlaups) • Some volcanoes occur in multiple hazard zones and can be linked to hydro-meteorological hazards, often creating disasters. **AO2** **The worst disasters happen on destructive plate boundaries** • Lava that is produced by subduction (andesitic), is often viscous, moves slowly and forms thicker and less extensive lava sheets - however, it also traps gases until the pressure is enough to blow the lava apart and pyroclastic material shoots into the air causing extreme danger, e.g. Mt St Helens. • Pyroclastic material can spread over a very large area, disrupting climate (global scale) or air traffic, e.g. Mt Pinatubo. On the other hazard, the hazard is also a by-product of human activity in proximity to the volcano, rather than the volcano itself. • The largest and most significant volcanoes are often found on volcanic islands on destructive plate boundaries, e.g. Caribbean Islands. This means the impact of an eruption has a proportionately higher impact on the island communities. On the other hand, some of these countries are well developed with close proximity to other countries who can support, e.g. Sicily is part of Italy, itself part of the EU.

Question number	Assess the idea that the most severe volcanic disasters only occur on destructive plate boundaries. Answer
	The worst disasters are not always associated with destructive plate boundaries • Basaltic lava is often found at constructive plate boundaries, which form bubbling lava lakes or fast-moving rivers of molten rock. Their extensiveness can threaten a wider areal extent. However, their ongoing eruption means the level of danger is monitored and human activity occurs regardless (e.g. Hawaii). • Some volcanic disasters can occur on volcanic hotspots (e.g. Iceland) and are often associated with the processes found on constructive boundaries, e.g. the extensive basalt lava fields, but also destructive plate boundaries as the magma plume melts the newly formed crust. • The worst volcanic disasters often result from the interaction of volcanic process with hydro-meteorological – and this can happen on constructive plate boundaries e.g. the melting of glaciers underneath the Jetstream in 2010 led to widespread disruption when Eyjafjallajokull erupted in 2010. On the other hand, very few people died in contrast to eruptions in the Philippines, a multiple-hazard zone where typhoons and landslides can cause devastation to isolated rural communities. **There are different ways to define 'the worst' volcanic disaster:** • Our ability to manage the impact of volcanic hazards has improved over time. In the past entire civilisations were at risk (e.g. Santorini in 1600 BC) – whereas today an eruption is often preceded by other tectonic hazards, permitting evacuation e.g. Mt Semeru, Indonesia • The worst volcanic hazard can be defined in different ways -for example, the impact on the economy, human life, and the environment, and be either quantitative, or spatial (extent) – all could be higher in a more developed country. On the other hand, human life could be significantly higher in a less developed country. Judgments will be based on whether the worst volcanic eruptions have occurred on destructive plate boundaries. Most are likely to argue that the type of eruption, and type of landscape associated with destructive plate boundaries means this is an easy judgement to make. However, others will note the complex geological and socio-economic factors that determine the outcome of an eruption. Overall, judgements should be based on the extent to which we can associate the worst impacts on human life with destructive plate boundaries.

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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	Name one fluvioglacial landform. Answer	Mark
2 (a)	**AO1 (1 mark)** Award **1** mark for a correctly identified landform: • Kames ❶ • Eskers ❶ • Kame terraces ❶ • Sandurs ❶ • Proglacial lakes ❶ • Meltwater channels ❶ • Kettleholes ❶ • Misfit stream ❶ • Outwash plains ❶. Do not accept • Glaciers / corries / tarns / erratics • Periglacial landforms / Solifluction lobes / pingoes • Ice wedges • Drumlins Allow any other reasonable response.	(1)

Question number	Calculate the mean expansion of the stone polygons. Answer	Mark
2 (b) (i)	**AO3 (2 marks)** Allow **1** mark for acceptable working out and **1** further mark for calculating the mean. • 1 + 1.13 + 2.34 + 1.42 + 1.08 + 1.23 = 8.2 ❶ • Mean = 1.37 ❶ Final answer should be given to 2 decimal places.	(2)

Question number	Suggest one reason for the formation of patterned ground shown. 2a.3c Answer	Mark
2(b)(ii)	**AO1 (2 marks)/AO2 (1 mark)** Award **1** mark for suggesting why a particular feature of the location would explain the formation of patterned ground with a further **2** extension marks to explain why or how periglacial process operates: • The sediments have been sorted by frost heave / seasonal frost / repeated freeze-thaw cycles / ice is present in the soil / ice lenses have lifted a layer of soil ❶ stones get colder faster than the soil around them / stones move through the permafrost to	(3)

	the surface / the ground expands ❶ leaving larger particles to move to the outskirts of the polygon by gravity ❶. • The climate is relatively warmer / periglacial / the soil is permafrost means the ground is subject to seasonal frost heave ❶ which causes the centre of the polygon to draw in more water / less saturated on the outskirts ❶ so smaller stones remain submerged at the centre / larger stones to move upwards / outwards ❶. • Relatively flatter ground in foreground means frost-heave is possible ❶ rather than more rapid mass movement caused by gravity ❶ which would lead to a series of steps and stripes, rather than stone polygons ❶. Accept any other appropriate response. Note more saturated material at the centre can intensify the freeze-thaw cycle, so accept ideas of repeated cycles.	

Question number	Explain two landforms that are created by a valley glacier. Answer	Mark
2 (c)	**AO1 (4 marks)** For each landform, award **1** mark for explaining how the landform is created and a further mark expansion explaining how this is caused by a valley glacier, up to a maximum **2** marks each. For example: • Glacial troughs / truncated spurs are deepened / widened / straightened (previously) V-shaped valleys ❶ by a valley glacier progressively plucking / quarrying / eroding the sides of the valley / removing interlocking spurs / excavating hollows or troughs in the valley floor ❶. • Hanging valleys form when water from tributary glacier valleys is forced to drop vertically ❶ resulting in a waterfall / leaving the water hanging high above the main trough / because the tributary glacier did not have as much erosive power ❶. • Ribbon lakes form because melted water accumulates in deeper troughs of the valley floor ❶ because a valley glacier flowed over softer, less resistant rock ❶. • Cirques/corries are steep-walled glaciated hollows caused by rotational movement of a glacier ❶ which causes plucking / quarrying / frost shattering of rocks in a headwall ❶. • Tarns are the lakes left behind by cirque glaciers melting ❶ because the glacier excavated a hollow on a mountain where water accumulates ❶. • Arêtes / pyramidal peaks are formed when the rock wall between several cirques progressively narrows ❶ as cirque glaciers erode the mountain from several sides ❶. • Glacial striations are formed from glacial abrasion ❶ as the glacier moves over the bedrock creating scratches or gouges / reflecting the direction of glacier movement over the rock ❶ . • Crag and tail are formed when glaciers move over a more resistant rock ❶ leaving a ridge of unconsolidated debris on the less side of that rock / ❶. • Roche moutonnee is formed when glaciers move over a more resistant rock ❶ using abrasion on the upstream side and plucking on the downstream side ❶. Accept any other reasonable response.	**(2 +2)**

Question number	Explain how glacial deposition creates distinctive landforms. 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: • Lateral moraine is formed when weathering creates material that moves through mass movement onto the glacier. When ice melts it deposits this material as unsorted angular morainic material at the side of a valley. • Medial moraines are formed when two glaciers meet the lateral moraines join together. When ice melts it deposits this material as unsorted angular morainic material in the middle of a valley. • Terminal material is deposited at the snout of a glacier can be reworked by further advances and retreats as recessional moraine. • Drumlins are formed when the advance of a glacier over till molds the till into egg shaped hills. The alignment of drumlins and other sub-glacial features reveals evidence of the speed and direction of ice flow. • Till refers to material deposited directly by the glacier (sometimes called boulder clay), often with very little sorting. Lodgment till is deposited at the base of the glacier (subglacial); ablation till accumulates initially on the surface of the glacier (supraglacial) and is then lowered to the ground surface by melting at the base of the glacier. • A till plain is formed when a sheet of ice at the base of a glacier detaches, melts in place and depositing the sediment – leaving an extensive flat plain. • Erratics are large boulders which are deposited by glaciers, having been transported a very long distance to an area where the geology is very different to where it started. Allow other reasonable explanations.

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Question number	Assess the influence of different stakeholders in managing threats to fragile glaciated landscapes. **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** • Relict and active glaciated landscapes have environmental and cultural value – polar, scientific research, wilderness, recreation, and spiritual religious associations. • Human activity can degrade the landscape and fragile ecology of Glacial landscapes – e.g., soil erosion, trampling, landslides, deforestation • Different stakeholders are involved in managing geographical issues and decision making. Some have greater influence than others. This might create inequality. • A spectrum of approaches is used to manage landscapes – ranging from protection, sustainable management and multiple economic uses. **AO2** **Some stakeholders have significant influence:** • Some 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. However, their actions can prevent other glacial landscapes being exploited for their environmental and cultural value – and run the risk of being unsustainable. • Legislative frameworks and comprehensive protection (e.g., Alpine Convention) might help some stakeholders see the environment as sacred / easily disrupted / essential for their survival. However, this approach can prevent other groups who depend on glaciated landscapes being allowed to exploit it, in some cases limiting economic development of a region, or country. • 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). On the other hand, or reducing visual impact of technology might increase the number of walkers to a renewed wilderness environment. • 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. **Management of fragile landscapes requires influence from a wider group of stakeholders:** • 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) • Antarctica's uniqueness requires appropriate response based on internationally agreed values / no resident population. The Treaty + Annexe restricts occupation/use so far. However, it also reduces the opportunity for economic use, instead more for research. On the other, ecologically sensitive tourism has the potential to raise awareness and understanding of why such landscapes are fragile. **It also depends on the nature of the threat to the landscapes** • Global action to mitigate against climate change, might be too late to support people affected by relict areas - small-scale management projects which might be more appropriate. However, care is needed to ensure that direct actions don't reduce resilience, and indirect actions don't alter natural systems. • Human activity can cause degradation of the landscape and ecology, e.g. soil erosion / landslides / avalanches, equally this, in turn, threatens the viability of agriculture, particularly in fragile environments close to the glacial margin. This raises a discussion about which use of the landscape is more appropriate / economically viable / which stakeholder should have priority. Judgements should be based around the influence that different stakeholders might have in successfully managing threats. Some candidates might note that in fragile landscapes there are many other factors that determine successful management, and some might consider how successful management is measured, or what that looks like in different contexts. Most are likely to judge that no stakeholder can operate in isolation and must work together to successfully manage the threat.

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		• 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	Mark
3(a)(i)	**AO3 (1 mark)** Award **1** mark for the correctly identified month. • July ❶	(1)

Question number	Answer	Mark
3(a)(ii)	**AO3 (2 marks)** Award **1 mark** for each correct description of the trend. • The score increases during spring / summer / from March to July ❶ • The score decreases during autumn / from July to October ❶ • The score remains low / at zero from November to February ❶	(2)

Question number	**Suggest which month would be the most sensible for these students to complete their fieldwork about the impact of human activity.** **Answer**	Mark
3(a)(iii)	**AO3 (2 marks)** Award **1 mark** for suggesting a reason for a month and a further **1 mark** for extending this, for example: • May - August have the highest tourism scores so there will be lots of visitors / the greatest mix of people ❶ with the greatest opportunity to ask people for their opinions / ask a range of people for their different opinions / see where they choose to walk / the damage they do to the landscape ❶ • March/April/May less wet ❶ making it a safer environment to travel to in order to complete the fieldwork ❶. • March / April / May might have less tourists ❶ so the views of the residents won't be skewed by the overcrowding ❶. Accept any other reasonable response.	(2)

Question number	Explain two factors students should consider before choosing their fieldwork locations. **Answer**	Mark
3(a)(iv)	**AO3 (4 marks)** Award **1** mark for identifying a legitimate reason for location selection and a further 1 mark for expanding how this help investigate the impact of human activity up to a maximum of **2** marks each. • Locations needed to be accessible / safe / available throughout the day / not vulnerable to landslide collapse / adverse weather ❶ so students' lives were not put in danger / a sensible range of measurements could be collected / in the time available ❶. • The other facilities / tourist attractions / geographical features / contrasting management strategies at the locations ❶ because these might influence the viewpoint of the people being interviewed / the type of people available to be interviewed / so students can collect data that answers the enquiry question ❶. • Location choice would be driven by a need to observe where people go in the village ❶ so they make a viable assessment of the impact they have on the landscape ❶. • The population demographics of the area ❶ because different age groups might have different opinions about the changes ❶. Accept any other appropriate response. Do not allow comments about factors which might impact on the timing of the trip rather than its location.	**(4)**

Question number	Assess the usefulness of ICT to process and present your findings. Answer
3(b)	**AO3 (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. **Indicative content guidance** *Please remember that the descriptor provides guidance as to the appropriate level. Bullet points covering the indicative content do not translate directly into marks.* Content depends on students' choice of research question. The use of ICT might include: • Shared spreadsheets to collate the information collected in the field – and then present as graphs or maps, or process statistical tests. • Cloud based storage through GIS platforms, e.g. ArcGIS, and then present data as maps. • The use of mobile and computer technology to process photos, video and audio representations of the landscape. • The use of social media and websites to report their findings to a wider audience. Assessment could include the following: • Judgement about the extent to which sufficient data was collected to do clear analysis either graphically or statistically. • Qualification about the data's relevance and whether it helped understand or explore the enquiry question, e.g. did the photos illustrate changes clearly, or was the data represented over change over an appropriate timescale. • Explanation about the value of the software packages with appropriate links to how they help contextualise the geographical data, e.g. how easy were they to use, whether they could actually make the conclusions, or whether students needed to make the final geographical decisions. • ICT systems should be clearly outlined with some supportive detail about relevance, ease of use and ability to manipulate data in a way that answered the geographical question. Some candidates might have been provided with technology to do this, e.g. from field-studies centre or may have engaged with virtual fieldwork. • Students might explain the importance or problems, and value, of collating and presenting data without ICT. All judgements are likely to be partial and tentative given the limited range of secondary data used. Do not accept fieldwork contexts for Regenerating Places and Diverse Places.

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	**1–3**	• Shows evidence that fieldwork investigation skills used may not have been fully appropriate or effective for the investigation of the geographical questions/issue. (AO3) • Considers the fieldwork investigation process/data/evidence, with limited relevant connections and/or judgements. (AO3) • Argument about the investigation is simplistic and/or generic. (AO3)
Level 2	**4–6**	• Shows evidence that fieldwork investigation skills used were largely appropriate and effective for the investigation of the geographical questions/issue. (AO3) • Critically considers the fieldwork investigation process/data/evidence in order to make some relevant connections and valid judgements. (AO3) • Argument about the investigation may have unbalanced consideration of factors, but is mostly coherent. (AO3)
Level 3	**7–9**	• Shows evidence that fieldwork investigation skills used were appropriate and effective for the investigation of the geographical questions/issue. (AO3) • Critically considers the fieldwork investigation process/data/evidence in order to make relevant connections and judgements that are supported by evidence. (AO3) • Argument about the investigation includes balanced consideration of factors and is fully developed and coherent. (AO3)

Question number	Evaluate the relative importance of physical and human geography factors in causing the Chamoli disaster. **Answer**
4	**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** • Tectonic hazards have social and economic impacts on the people, economy and environment in emerging and developing countries. • Tectonic hazard profiles are important in understanding contrasting hazards impacts, e.g. areal extent, duration, speed of onset. • Glaciated landscapes are important economically (farming, mining, hydroelectric power, tourism, forestry). • Glaciated landscapes face varying degrees of treat from both natural hazards and human activity. • Climate warming is context risk in glaciated landscapes – meaning that successful management of these unique and fragile landscapes is increasingly challenging. **AO2** **Physical geography plays an important role** • The Chamoli region is in the Himalayas - a collision boundary – where plate tectonic processes operate continuously to create high altitude environment where glaciers have created steep mountain valleys where glaciers have formed. (Fig 4a) • The steep mountain sides focuses the debris flow, accelerating it, causing it to mix with the water in Rishiganga River (Fig 4a). However, increased contact with valley sides as it travelled downstream resulted in a reduction in debris flow speed (Fig 4c), which seems to have resulted in slightly fewer deaths and damage at the Tapovan in contrast to the destruction of the Raini. Equally early warning systems prevented the loss of life for some workers. **Human Geography plays an important role** • The Dams on the Rishiganga River are the direct result of attempts to generate HEP (Fig 4c) and economic growth (Fig 3c). On the other hand, they significantly increase the level of economic vulnerability (Fig. 4b). • A strategy to move to HEP might also be seen as an attempt to mitigate climate change (Fig 4b), and it should be noted that the Srinagar Dam in

Question number	Evaluate the relative importance of physical and human geography factors in causing the Chamoli disaster. **Answer**
	particular was the reason water levels were able to be controlled, preventing further devastation downstream (Fig. 4c). On the other hand, the melting on the ice created by the rock could easily create a similar flood in the future that could be equally devastating – catastrophic floods are a regular occurrence (Fig 4d). • There seems to have been some opportunity to allow evacuation of villages such as Joshimath (Fig 4c), and for workers to shelter in tunnels at Tapovan. However, this was not possible in all locations, e.g. Raini Dam. On the other hand, this could be the result of closer proximity to the source of the debris flow. • Surrounding villages were able to transport aid by helicopter (Fig 4d). However, this is a reminder of the remoteness of the location, which can inhibit effective hazard response. **But it is also the characteristics of the hazard event itself** • The exposure, and therefore, instability of Nanda Gunthi is likely the by-product of climate warming causing ice to melt at the top of the mountain. This kind of context warming is likely to continue (Fig 4d). However, it is important not to make generalisations about climate change on the basis of a single event (Fig 4b). • The size of material that collapse from the mountain was huge – resulting in catastrophic amount of material falling onto the glacier and subsequent flow. Judgements and conclusions could be based around whether human or physical processes are responsible for the scale of the disaster in the Chamoli region. Some candidates might consider the question from the perspective of the Hazard Risk equation. Other might note that that physical geography was responsible for the event itself as well as creating the vulnerable context. Most will probably conclude that, despite this, the hazard risk itself is the result of over-exploitation of a remote, glaciated valley to build high value infrastructure that was unlikely to cope with catastrophic flooding.

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	Name one landform caused by mass movement. Answer	Mark
5(a)	**AO3 (1 mark)** Award **1** mark for a correctly identified landform. • Slump ❶ • Rotational scar ❶ • Talus scree slope ❶ • Terraced cliff profiles ❶ • Rockfall / Mudflow / Landslide ❶ • Stack ❶ **Do not accept** • Cave / Arches / Cliffs / Geos / Wave cut platforms • Offshore bar / spits / tombolos • V-shaped valley • Sand dunes • Fjords / Rias	**(1)**

Question number	Calculate the mean loss of cliff material. Answer	Mark
5 (b)	**AO3 (1 mark)** Allow **1** mark for acceptable working out and **1** further mark for calculating the mean. • 1 + 3 + 35 + 592 + 994 + 186 = 1811 ❶ • 1811 / 6 = 301.83 ❶ Final answer should be given to 2 decimal places.	**(2)**

Question number	Suggest one reason why the rate of cliff erosion varies. Answer	Mark
5(c)	**AO1 (2 marks)/AO2 (1 mark)** Award **1** mark for suggesting a reason why the rate of retreat varies in Figure 4 with a further **2** extension marks to explain how this affects the rate of retreat: • Storms are more frequent / wind is stronger ❶ so there are more destructive waves / hydraulic action / attrition are more powerful ❶ causing more erosion of beach / cliff material ❶ • Backwash is stronger / destructive waves are more likely in winter than summer ❶ so beach material is gradually moved offshore ❶ removing natural protection for the cliff ❶ • Winter months bring heavier rainfall / colder temperatures ❶ causing subaerial / rock breakdown processes to be more active / cliffs to be more saturated ❶ so landslides / mass movement processes are more likely to occur ❶. • Cliff management / sea defences are present / might fail / be improved / ❶ changing exposure of the cliff to marine processes ❶ so undercutting / erosional processes will speed up / slow down ❶. Accept any other appropriate response. – although note the initial AO2 idea must be identified from Figure 4.	**(3)**

Question number	Explain two parts of a coastal sediment cell system (2B.5c) Answer	Mark
5(d)	**AO1 (4 marks)** For each reason, award **1** mark for explaining a part of the sediment cell, and a further mark expansion for explaining how this operates, up to a maximum **2** marks each. For example: • The source / input of material is the result of coastal erosion processes ❶ when marine processes, e.g., attrition, hydraulic action, abrasion and corrosion act at the base of cliffs to remove rock ❶. • Material is transported along the coast because of littoral drift / currents / wind (saltation) ❶ because the swash moves at an angle, and backwash perpendicular / material has been eroded down to a size small enough to be transported / backwash continues out to sea along the sea bed ❶. • Sinks / output for material happen when it is deposited / beaches are formed ❶ because / water slows down / loses energy / constructive waves dominate / the transport material has been eroded by attrition / abrasion ❶. • Some sediment enters the cell from rivers, lagoons, or offshore transport from other cells ❶ as water slows down, loses energy and deposits the sediment it is carrying ❶. Accept any other reasonable responses.	**(4)**

Question number	Explain how vegetation helps stabilize sandy coastlines. Answer	
5(e)	**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: • Primary / plant succession can happen when bare sand or mud is colonised by plants. • Plants and ecosystems provide an energy buffer and help to dissipate wave energy. The presence of vegetation in coastal areas improves slope stability, consolidates sediment and reduces wave energy moving onshore. • Plant succession over time happens as pioneer plants colonise areas, add humus, moisture and stabilise loose sand and over time new plants establish themselves in these new conditions and take over. • Newly established salt marshes act as buffer zones between the sea and land to absorb coastal floods and take the impact of storms. Coastal ecosystems provide a buffer against wind erosion. The width of the vegetation buffer will be significant in its role as an energy dissipator and stabilise coastal areas. • If there is enough, sand dries out and blows towards the land, trapped around obstacles to form dunes, which collect more sand and provide conditions for pioneer plants to colonise the dunes and hold the sand together. • Long blades of cordgrass in a salt marsh can trap sediment building up a muddy substrate which helps stabilise the roots of other plant species and leads to further sediment deposition. • Marram grass establishes good root networks in bare sand which stabilities the dune, so it can cope with gale-force winds; it can trap sand / sediment building up a sand dune behind it, which grows by encouraging further sand deposition, and absorb wave energy. • River flow is slowed by already established spits / bars / barrier beaches creating low energy salt marsh environments / plant succession as tiny clay particles stick to each other / flocculation. Do not accept explanations about halosere succession unless clearly linked to their place at a sandy coastline (e.g. behind a spit).	

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	**Assess whether storm surges are the main cause of increasing risk for coastlines.** **Answer**
5(f)	**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** • A storm surge is a rise in water levels above the normal level, because of the combined effects of wind and low pressure, particularly when associated with depressions and tropical cyclones. • The risk of storm surge is a by-product of vulnerability (defences can be breached causing cities to flood), and local geographical factors. • Increased occurrence storm surges are a feature of climate change, through sea level rise or magnitude of storms. **AO2** **Storms surges are the main cause** • In terms of hazard events, climate change might lead to warm oceans and increased heat energy driving more powerful and frequent storms, however some climate change scenarios based on natural variability (e.g. ENSO) suggest a decrease in tropical storm formation in some ocean basins. • There are other hazards for some coastlines, e.g. the Maldives is more vulnerable to sea level rise, whilst others are vulnerable to both tropical storms and sea level rise (e.g. Bangladesh), and associated rapid coastal erosion, particularly on those with less resistant geology. • Sea level rise might be viewed as a long-term irreversible problem, particularly if eustatic sea level rise is seen as a naturally occurring result of long-term climate change.

Question number	Assess whether storm surges are the main cause of increasing risk for coastlines. **Answer**
	• Storm surges are a problem for some coastlines because they are a low-lying or funnel-shaped estuarine coast (e.g. Thames Estuary) – this aspect of physical geography is unlikely to change. • In terms of physical vulnerability, subsidence and lack of vegetation exacerbate the risk posed by tropical storms; equally tropical storms can be the reason for vegetation removal. **There are other causes of increasing risk:** • Cliff recession is a greater risk on coastlines, particularly when lithology and geological structure are less resistant. On the other hand, storm surges are likely to trigger changes that are the result of longer-term processes. • Human activity is an increasing risk, particularly in built-up, crowded coastlines, e.g. Trinidad and Tobago – where the development might be unregulated. On the other hand, this may not be a problem until a storm surge overwhelms the defences that have been built. **The level of risk is not increasing at all coastlines** • The changing nature of the threat for some coastlines might lead to mitigation and adaptation, e.g. the Venice sea wall – this reduces the level of risk in the short or long term depending on the socio-economic situation. • Storm surges can be a powerful motivation for improving the level of defences in a city, e.g. the Isle of Portland; where road access would have catastrophic consequences for the economy. On the other, it may not be cost-effective to provide defences that can cope with the future magnitude of storm surges, e.g. Slapton. Some candidates might see climate change as a contextual (changing) factor whilst changes to human activity affecting vulnerability are a situational factor, where a particularly strong tropical cyclone or depression is a short-term triggering factor, perhaps because of natural variability elsewhere in the world (e.g. ENSO fluctuation).

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	Mark
6(a)(i)	**AO3 (1 mark)** Award **1** mark for a correctly identified month. • August ❶	(1)

Question number	Answer	Mark
6(a)(ii)	**AO3 (2 mark)** Award **1 mark** for each correctly described trend. • The score increases from March / April to July / August / as temperature rises / towards the summer months ❶ • The score decreases from July / August to October / as temperature falls / towards the winter months ❶ • The score remains low / at zero from November to March / during the winter months ❶ Accept any other appropriate response. There is no requirement to quote data.	(2)

Question number	Suggest which month would be the most sensible for these students to complete their fieldwork about differing viewpoints. **Answer**	Mark
6(a)(iii)	**AO3 (2 marks)** Award **1 mark** for suggesting a reason for a month and a further **1 mark** for extending this, for example: • July / August have the highest tourism scores so there will be lots of visitors / the greatest mix of people ❶ with the greatest opportunity to ask people for their opinions / ask a range of people for their different opinions / see where they choose to walk / the damage they do to the landscape ❶ • March / April / May will have better weather ❶ making it a safer environment to travel to in order to complete the fieldwork ❶. • March / April / May might have less tourists (1) so the views of the residents won't be skewed by the overcrowding (1). Accept any other reasonable response.	(2)

Question number	Explain two factors students should consider before choosing their fieldwork locations. **Answer**	Mark

6(a)(iv)	**AO3 (4 marks)** Award **1** mark for identifying a legitimate reason for location selection and a further 1 mark for expanding how this helps investigate the impact of human activity up to a maximum of **2** marks each. • Locations needed to be accessible / safe / available at low tide / not vulnerable to cliff collapse ❶ so students' lives were not put in danger / a sensible range of measurements could be collected / in the time available ❶. • The other facilities / tourist attractions / geographical features / coastal management at the locations / contrasting management strategies ❶ because there might be different impacts at different places / these might influence the viewpoint of the people being interviewed / the type of people available to be interviewed / so students can collect data that answers the enquiry question ❶. • Location choice would be driven by a need to observe where people go in Whitehaven ❶ so they make a viable assessment of the impact they have on the landscape ❶. • The population demographics of the area ❶ because different age groups might have different opinions about the changes ❶. Do not allow comments about factors which might impact the timing of the trip (e.g. weather conditions) rather than its location. Accept any other appropriate response.	**(4)**

Question number	Assess the usefulness of ICT to process and present your findings. Answer
6(b)	**AO3 (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. **Indicative content guidance** *Please remember that the descriptor provides guidance as to the appropriate level. Bullet points covering the indicative content do not translate directly into marks.* Content depends on students' choice of research question. The use of ICT might include: • Shared spreadsheets to collate the information collected in the field – and then present as graphs or maps, or process statistical tests. • Cloud based storage through GIS platforms, e.g. ArcGIS, and then present data as maps. • The use of mobile and computer technology to process photos, video and audio representations of the landscape. • The use of social media and websites to report their findings to a wider audience. Assessment could include the following: • Judgement about the extent to which sufficient data was collected to do clear analysis either graphically or statistically. • Qualification about the data's relevance and whether it helped understand or explore the enquiry question, e.g. did the photos illustrate changes clearly, or was the data represented over change over an appropriate timescale. • Explanation about the value of the software packages with appropriate links to how they help contextualise the geographical data, e.g. how easy were they to use, whether they could actually make the conclusions, or whether students needed to make the final geographical decisions. • ICT systems should be clearly outlined with some supportive detail about relevance, ease of use and ability to manipulate data in a way that answered the geographical question. Some candidates might have been provided with technology to do this, e.g. from field-studies centre or may have engaged with virtual fieldwork. • Students might explain the importance or problems, and value, of collating and presenting data without ICT. All judgements are likely to be partial and tentative given the limited range of secondary data used. Do not accept fieldwork contexts for Regenerating Places and Diverse Places.

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	**1–3**	• Shows evidence that fieldwork investigation skills used may not have been fully appropriate or effective for the investigation of the geographical questions/issue. (AO3) • Considers the fieldwork investigation process/data/evidence, with limited relevant connections and/or judgements. (AO3) • Argument about the investigation is simplistic and/or generic. (AO3)
Level 2	**4–6**	• Shows evidence that fieldwork investigation skills used were largely appropriate and effective for the investigation of the geographical questions/issue. (AO3) • Critically considers the fieldwork investigation process/data/evidence in order to make some relevant connections and valid judgements. (AO3) • Argument about the investigation may have unbalanced consideration of factors, but is mostly coherent. (AO3)
Level 3	**7–9**	• Shows evidence that fieldwork investigation skills used were appropriate and effective for the investigation of the geographical questions/issue. (AO3) • Critically considers the fieldwork investigation process/data/evidence in order to make relevant connections and judgements that are supported by evidence. (AO3) • Argument about the investigation includes balanced consideration of factors and is fully developed and coherent. (AO3)

Question number	Evaluate the relative importance of physical and human geography in causing the Tonga disaster. **Answer**
7	**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** • The social and economic impacts of tectonic hazards on the people, economy and environment in emerging and developing countries. • Tectonic hazard profiles are important in understanding contrasting hazards impacts, e.g., areal extent, duration, speed of onset. • Understanding the complex trends and patterns for tectonic disasters helps explain differential impacts. • There are different approaches to managing the risks associated with coastal flooding. **AO2** **Physical geography plays an important role:** • Tonga is on a convergent plate boundary which has created a series of low-lying, flat, volcanic islands, vulnerable to tectonic events that create flooding (Fig 5a). On the other hand, the islands are sufficiently remote that the population is not large. • Tonga was particularly close to the underwater volcano (Fig 5a). However, the islands were not affected equally (Fig 5a, b, c). • The isolation, flatness and low-lying nature of the islands leave them particularly vulnerable to tsunamis – since there are no realistic means of evacuation (Fig 5a), and the single internet cable was severed. On the other hand, this does not seem to have resulted in significant loss of life, and aid began to arrive within a few days. **Human Geography plays an important role:** • Communications with the islanders was severed, and it took several days for rescue ships to arrive (Fig 5a). On the other hand, there were very few deaths on the islands. • The economic and social vulnerability is clearly higher in Tonga, e.g., houses / deaths / injuries (Fig 5c). On the other hand, the management strategies used in places like Japan disrupted the lives of significantly more people. • Aid has been provided, particularly from Australia and New Zealand, both developed countries (Fig 5d). On the other hand, it still took 5 days to

Question number	Evaluate the relative importance of physical and human geography in causing the Tonga disaster. **Answer**
	arrive – with some damage to communications difficult to repair and potentially irreversible. **But it is also the characteristics of the hazard event itself:** • This volcanic eruption was particularly strong (Fig 5a) – and created a hazard with a high areal extent, i.e. a tsunami that spread around the Pacific Ocean (Fig 5c). On the other hand, the impact on locations much further away is also significant, e.g. oil spillage in Peru (Fig 5c). • Ashfall had a particularly high impact on both rescue efforts (Fig 5d), and the availability of food and water both in the short- and long-term. (Fig 5c and 5d). On the other hand, the ash was cleared from the runway to allow planes to bring food / water (Fig 5d). Judgments and conclusions could be based on whether human or physical processes are responsible for the scale of the disaster in the Tonga region. Some candidates might consider the question from the perspective of the Hazard Risk equation. Others might note that physical geography was responsible for the event itself as well as creating the vulnerable context – where people are extremely vulnerable to the long-term effects of ashfall. However, most will probably conclude that, despite this, the hazard risk itself is the result of living on low-lying remote islands that was unlikely to cope with a catastrophic tsunami.

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)

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