



Mark Scheme (Results)

Summer 2019

Pearson Edexcel GCE
In Geography (8GE0) Paper 01

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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

Question number	State which type of earthquake wave travels fastest. Answer	Mark
1(a)	AO1 (1 mark) Award 1 mark for a correctly identified earthquake wave: Primary / P wave / push-pull wave ❶	(1)

Question number	Compare the distribution of reported ground shaking between the February and November earthquakes. Answer	Mark
1(b)(i)	AO3 (2 marks) Award 1 mark for each correctly identified comparison between the pattern of ground shaking. - There are more reports of shaking (1) - The intensity of the shaking was greater (1) - The shaking in November is more concentrated towards the north/north-east of Taiwan ❶ - There was stronger shaking recorded in the south of Taiwan in the February earthquake ❶ More shaking was recorded closer to the epicentre in the February EQ. ❶ - None in west/southwest in Nov but concentrated there in February ❶ Accept any other correct comparison based on figure 1. Do not accept statements that do not use comparative language to describe the pattern.	(2)

Question number	Suggest one reason for the pattern of reported ground shaking in the February earthquake. Answer	Mark
1(b)(ii)	AO1 (2 marks)/AO2 (1 mark) Award 1 mark for analysing the resource to identify a possible reason for the pattern in February, and a further 2 marks for further explanation, for example: • The plate boundary lies to the West ❶ so EQ waves are more likely to be felt ❶ by people living in nearby built up areas/settlements ❶ • The epicentre is on land / in the SW ❶ so EQ waves are stronger / haven't dissipated ❶ and will be more noticeable for people living in nearby ❶ • Denser population near to epicentre ❶ as communities have grown up here for access to coast for trade ❶ so more people to report it ❶ • Time of the day is crucial in February ❶ many might be leaving work to travel home ❶ so more people around to notice it and report it ❶ • More reported near coast ❶ because sediment might be looser / more sandy ❶ so more shaking noticed by people ❶ Accept any other appropriate response based on figure 1.	(3)

Question number	Explain two strategies used to modify tectonic hazard events. Answer	Mark
1(c)	AO1 (4 marks) For each reason, award 1 mark for explaining a strategy to modify hazard events and a further 1 mark for explain why the hazard event is lower. For example: • Land use zoning changes where people live ❶ to ensures they don't live in areas where they might be affected by hazards e.g. landslides/liquefaction ❶ • Retrofit buildings / make hazard-resistant/ aseismic design changes to how buildings are constructed ❶ so that they can absorb energy of earthquakes / volcanoes / tsunami ❶ • Ash resistant roofs are stronger / can cope with the weight of ash ❶ reduces deaths/damage from collapse ❶ • Walls / Engineering defences stand in the way of waves hitting buildings / disperse energy ❶ from tsunami ❶ • Well organised emergency services can help rescue people (1) so they are less likely to die from injuries (1) • Prediction / warning systems alert people to a threat (1) so they have time to evacuate (1) • Diversion of lava flows/landslides/avalanches ❶ limits damage to buildings / settlements ❶ • Educating people makes them aware / prepared ❶ so they take the right actions to evacuate / take cover ❶ Accept any other appropriate response. Do not accept strategies that only modify vulnerability and resilience, or loss, unless they are linked to a modification of hazard event.	(4)

Question number	Explain how plate tectonic theory is used to explain plate movements. 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 divided into plates which 'float' on the semi-molten asthenosphere, allowing them to move in relation to each other • Movement has been explained by convection currents in the mantle, and more recently by slab pull • Sea-floor spreading helps create new oceanic crust at divergent/ constructive plate boundaries. Melted, mobile material rises from the asthenosphere to the surface. • New crust moves away from ocean ridges and cools, therefore increases in density, and sinks into the mantle (subduction) at ocean trenches causing plates to drag the warmer less dense part of the plate (slab pull) into the asthenosphere • Subducted crust melts into the magma at destructive / convergent plate boundaries in the Benioff zone • Palaeomagnetism patterns are explained by seafloor spreading and magnetic pole reversals, providing the driving force for moving plates apart (e.g. Mid-Atlantic ridge). There is other evidence, e.g. Pangea, fossils that suggests plates have moved over time. Accept any other appropriate response. Allow answer which discusses how well the theory explains plate movement and its limitations.

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 areal extent is the most important factor that determines the impact of volcanic eruptions. 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 • Areal extent is the distance that erupted material travels, and it ranges from short-distances (lava), to ash being transported around the world. • Volcanic eruptions produce a large range of material – lava flows, pyroclastic flows, ash falls, gas eruptions, and can cause lahars and jokulhlaups • The impact of eruptions can be measured by the magnitude and type of volcanic eruption, as well as the social and economic impacts. • Areal extent is one element of the hazard profile (others include magnitude/frequency/duration/speed of onset). AO2 • Areal extent is an important factor because some impacts can be global, e.g. ash fall can travel million km² and change global temperature, tsunamis may spread effects 1000s of km. Whereas, impacts of rock and ash create huge problems for local communities. • Some impacts of eruptions can have knock on effects for global flows and networks / supply chains and become mega-disasters, whilst the visible impact is actually very localised, e.g. Eyjafjallajökull 2010. • Sometimes the very local nature of a volcanic eruption can cause serious impacts on surrounding environments, e.g. melting/ extending glaciers or tsunami waves, which dramatically increases the areal extent • Local/regional weather conditions can worsen impacts (e.g. hurricanes before/after a tectonic hazard strikes) • Areal extent is only one factor – other ways are shown on hazard-profiles, and other factors may be argued to be more/less important • Magnitude can be argued to be most important: if a VEI6/7 erupted today, millions of people could be affected through climatic impacts

Question number	Assess whether areal extent is the most important factor that determines the impact of volcanic eruptions. Answer
	• Volcanoes often have a slow speed of onset, with warnings possible, and evacuation strategies implemented. This can reduce the impact in the local community, but may not prevent global impact. Contrasting e.g. of Mount Ontake (2014) which had no warnings and killed 63. • Duration of eruption can be linked to type of volcano, e.g. shield volcanoes will often erupt longer with lower magnitude (e.g. Kilauea), but have a lower impact and composite volcanoes (e.g. Soufriere Hills) • It also depends on how we judge impact of eruptions (e.g. deaths/local economic impact/ global costs) • Monitoring and preparation strategies can decrease the impact of volcanic eruptions and associated secondary hazards – these are more likely to be in countries that have recently experienced eruptions, e.g. Iceland 2010/2014. • Some countries are better connected than others so the impact globally on supply chain might be lower but the local-scale impacts on the community will be higher, e.g. Pinatubo, Philippines in 1991 • Sometimes the social impact of eruptions is greater than economic, but this might depend on the quality of core infrastructure, both to monitor and mitigate eruption effects, but also the damage done, e.g. disruption to flights after Eyjafjallajokull. Assessment and judgement will be based around whether areal extent of volcanoes determines the impacts, but note that sometimes the biggest impacts are often felt locally rather than globally. Much depends on how impact is measured, and final judgement might comment on how in different types of countries, different parts of the hazard profile matter more.

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) • 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 marks) Allow 1 mark for a correct answer. D: Snowfall ❶ A is not correct because calving is not accumulation. B is not correct, because it's in the zone of ablation too. C: is not correct, because it's also in the zone of ablation.	(1)

Question number	Answer	Mark
2 (b)	AO3 (2 marks) Award 1 mark for each correctly completed label - A: Equilibrium Line ❶ - B: Ablation Zone ❶	(2)

Question number	Suggest one reason for the avalanche. Answer	Mark
2(c)	AO1 (2 marks)/AO2 (1 mark) Award 1 mark for analysing the resource to explain an identified a feature in the surrounding photo that might cause the avalanche and a further 2 marks for explaining factor causes an avalanche, for example: - Recent snowfall compacts snow ❶ adding weight / stress to the snowpack ❶ so gravity becomes an overwhelming force / the cohesive strength of the snowpack is overwhelmed ❶ - Earthquakes / Road building / car transport / skiers cause vibration ❶ reducing the internal strength of the snowpack ❶ so that another trigger easily results in a landslide ❶ - Loose snow which hasn't compacted ❶ doesn't have cohesive strength ❶ so additional stresses can easily trigger an avalanche. - Warming temperatures / increased insolation with coming of spring / global warming influence ❶ leads to melting of outer ice ❶ so this layer becomes heavier and more likely to slide / increases meltwater / basal sliding ❶ - Rockfalls / steep slope adds stress to the snowpack ❶ so a further vibration could easily trigger the avalanche ❶ because stress > strength ❶ Accept any other appropriate response.	(3)

Question number	Explain two processes of water movement within glaciers. Answer	Mark
2(d)	AO1 (4 marks) For each reason, award 1 mark for explaining a process of water movement and a further mark expansion explaining how this works within the glacial system, up to a maximum 2 marks each. For example: • Englacial: flows of water within the ice to the base 1 through crevasses /moulins 1 • Sub-glacial flows: basal meltwater flows at the base of a glacier / lubricates glacial flow / Ice-marginal flow, along the side of a glacier 1 because of hydrostatic pressure / pressure created by the mass of ice on top / climate change 1 • Supraglacial / surface flows / surface melt mainly in ablation zone 1 flows off the glacier, or through cracks in the glacial ice / stored in lakes on the surface of the ice / end of the glacier, ie proglacial lakes 1 Accept any other reasonable response.	(4)

Question number	Answer
2(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: • Glacial deposits have a huge variety of sizes, ranging from erratics to boulder clay. Larger particles might be aligned with glacial flow. Tills and moraines may be included, which contain unsorted material. • Glacial deposits are often unsorted, lacking distinct layers, and may include erratics deposited when their weight is too much to be carried • Fluvioglacial deposits are more sorted with larger material deposited first and finer material carried further from the glacier. • Fluvioglacial deposits are carried by meltwater streams so the sediment is eroded to become more rounded/smoothed due to attrition compared to glacial deposits which are more angular. Eskers and kames may be mentioned, sorted as bigger material at the bottom. Allow other reasonable explanations.

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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 importance of long-term climate change in explaining the distribution of glacial landscapes. Answer
2(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 • Long-term climate change is caused by Milankovitch cycles leading to altered seasons, which could be exacerbated by solar output variations (sunspots) and volcanic eruptions on a shorter timescale, leading to cooling contributing to ice advance. • Glacial landscapes might include those associated with erosion process (cirques, valley glaciers, arêtes, pyramidal peaks, glacial troughs, truncated spurs, ribbon lakes), ice sheet scour, as well as ice contact depositional features (moraines, tills, erratics). Their distribution is influenced by latitude and altitude. • Glacial landscapes also refers to Periglacial and Alpine landscapes – the distribution of both is influenced by altitude. • Distribution refers to both high-latitude ice sheets and the spatial extent of ice-sheets in both northern and southern hemispheres including by altitude. Relict landscapes are relevant as well as active ice-sheets AO2 LT climate is important for the distribution of glacial landscapes • Variations linked to Milankovitch cycles work on different timescales (Orbit: 100k years, Tilt: 41K years, and Wobble (25K years) to alter temperatures and cause changes to glacial budgets with accumulation and spread of glacial conditions, or more ablation. On the other hand shorter term variations cause similar change – these are the result of solar output changes (sunspots) and volcanic eruptions. These may exacerbate impacts of Milankovitch. • Change happens on different spatial scales – e.g. glacial surges after the Tambora eruption are unlikely to make much change to existing landscapes. However long-term changes associated with Loch Lomond stadial might

Question number	Assess the importance of long-term climate change in explaining the distribution of glacial landscapes. Answer
	substantially alter the distribution of landscapes because of sea-level rise/fall / expansion of ice sheets across Northern Europe - Global and local temperatures affect rates of accumulation and ablation. On the other hand, some parts of the world have been characterised for long periods by the necessary conditions for glaciation, extending the distribution of glacial landscapes, both of erosion and deposition - Retreat of glaciers during warmer periods reduces erosion and allows for more extensive formation of depositional landscapes, or relict landscapes. On the other hand, at high latitudes, thinning ice is only speeding up the flow of glaciers at this stage e.g. in Antarctica Other factors that affect distribution include latitude and altitude, position of continents (fewer in southern hemisphere), though the significance of these will be altered by climate change - Long-term climate change also means some areas have been subject to sequences of ice ages so will have seen landscapes changed or removed by new glacial flows. Relict environments show the extent of past glaciations e.g. in the UK - The distribution of landforms within landscapes also depends on rock type and its susceptibility to erosion by advancing / retreating glaciers, e.g. the Alps is soft sedimentary rock with spectacular erosion landforms - Albedo also plays a role effect as a positive feedback mechanism – and is a way that glacial landscapes can affect climate change... - Recent climate change is reducing spread of active glacial landscapes to higher altitudes. Most are likely to judge that climate change linked to Milankovitch cycles is the main factor that explains distribution of glacial landscapes, but that landscapes might include superimposed signals of other factors, e.g. geology. Some might compare recent changes in climate leading to a retreat of glacial landscapes to high latitudes and polar regions.

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) • 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 a correctly stated reason. - To understand / reconstruct the direction of ice flow ❶ - To see where the glacier started from ❶ - To see if there is a preferred direction / if they face in one particular direction ❶ - To see how direction affects meltwater ❶ - To provide evidence for theory that most corries face NE in the Northern Hemisphere ❶ Accept any other reasonable response	(1)

Question number	Answer	Mark
3(a)(ii)	AO3 (1 mark) 49 ❶	(1)

Question number	Answer	Mark
3(a)(iii)	AO3 (1 mark) 12+3+4.1+0.08 = 19.18 ❶ Do not accept any alternative answer.	(1)

Question number	Answer	Mark
3(a)(iv)	AO3 (2 marks) Award 1 mark for suggesting a reason based on the fieldwork scenario and 1 additional mark for justification. - Because there are categories of corrie data ❶ and Chi² establishes whether there is an uneven distribution pattern amongst these categories ❶ - Test for relationship ❶ between the number of corries and the category of the orientation ❶ - To determine if there is a pattern in the distribution of corrie orientation ❶ because a category with a distinctively high number would indicate the direction of ice flow ❶	(2)

	Accept any other reasonable response.	
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Question number	Answer	Mark
3(a)(v)	AO3 (4 marks) For each type of fieldwork, award 1 mark for identifying a method, and a further 1 mark for justification of why it extends the investigation: • Field sketching / photos 1 might help show the orientation of landforms (e.g. drumlins), or help to record evidence of direction where the end of glacial advance is found / striations / rock provenance 1 • Measure cross section / height / shape / direction of valley landforms at various locations, e.g. U-shaped valleys / back walls of corries 1 to establish where the glacier began or where it flowed to 1. • Measure sediment size / shape / orientation using callipers / Powers Scale 1 to establish where smaller-sediment is found relative to larger / long-axis will help show the direction that glaciers flowed over previous deposited material 1 • Measure roche mountonee / drumlin orientations using compass and ranging poles 1 as steep slope will be upstream side of landform 1. • Count the number of striations on the sides of rock / measure angle of striations on the side of a rock 1 to see which direction the ice was moving when it scraped over the rock 1. Other possible features: stoss and lee / proglacial lakes 1 Accept any other appropriate response. Accept any other appropriate response. Methods may refer to secondary data for comparison but must include a primary data collection method	(4)

Question number	Assess how the sampling procedures and sample size affected your results. 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 Content depends on students' choice of enquiry question and the research sources used. • Sampling procedures used should be explained (systematic / stratified / random, allow opportunistic/pragmatic) and justified with reference to the field research question. NB expect good answers to explain how sampling was done, e.g. explain random sampling procedure used. • Sample size could be considered in terms of numbers of people/locations/ transect/ point samples. Also, the time of the day or week or year • Credit planning/research before going out to select a representative samples / locations for the visit (e.g. use of map/google image) • the area or population being sampled is likely to be a key factor in assessing the suitable method and the number sampled. • credit assessment of issues of bias and reliability linked to sampling procedures/strategy and locations of fieldwork data collection if appropriate • credit comments about time / cost / safety where linked to the specifics of the research question and the chosen location • credit assessment of size of sample in relation to chosen statistical technique for data analysis • Effects of these procedures on validity and reliability of results should be assessed.

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)

Level	Mark	Descriptor
		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 effectiveness of the management strategies shown. 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 • Glaciated landscapes are important economically (farming, tourism, forestry), and they have environmental and cultural value (polar scientific research, wilderness recreation, and spiritual/religious association) • Attitudes towards landscapes range from exploitation to preservation. • Threats include those from natural hazards (avalanches, landslides, earthquakes, glacial outburst floods) and human activities (leisure and tourism, travel networks, reservoir construction and urbanisation) as well as global warming. AO2 Management is effective • Ski-resorts are in a position to mitigate the effects, for example, the use of hybrid buses limits climate change which, in turn, helps limit the impacts of CC that threaten core business (small scale though) • Alpine Convention helps ensure key players work together to restore damage done to buildings and environment because of tourism. • Alpine Initiative encourages rail travel which might bring more tourism, but equally encourages rail over car, limiting CO2 emissions and congestions in beautiful Alpine landscapes (Fig 4b) • Hazard management is in place in Bondo Village Management strategies are not necessarily effective: • Tourism is associated with large pieces of infrastructure to facilitate skiing and hiking (e.g. Resorts, suspension bridge). • Ski-resorts have a particularly big impact on the environment (fig 4b) due to visual impact of new infrastructure (fig. 4c) • Tourism might be expected to increase because of the construction of the Gotthard Base Tunnel (fig 4b/4c), which creates better and quicker access through the Alps.

Question number	Evaluate the effectiveness of the management strategies shown. Answer
	But there are other threats to worry about • Tectonic events might trigger avalanches, mudslides and rock slides. • Permafrost melt is likely linked to global warming and the failure of precipitation to provide enough snow for ski-season. Management strategies are used (Flocon Vert) it may be too little too late(Fig. 4c) • The mudslide in Bondo village points to the combination of tectonic and climatic factors, i.e. a high precipitation event which might have been caused by global warming. There does not appear to be adequate management as 8 died in 2017. Judgements and conclusions should be based around whether threats to the Alpine glaciated landscapes are being managed effectively. Access to Alps being made more sustainable but this may encourage even more visitors which will put pressure on space and resources. Attempts to manage global warming seem inadequate and unlikely to make much difference on a global scale, though locally congestion may be improved. Tourism is in a position both to attempt to mitigate and manage some threats, since their income relies on this – i.e. sustainable management, rather than an attitude of total exploitation or protection. Most are likely to conclude the strategies have their limitations.

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
5(a)	AO1 (1 mark) • B = Longshore drift ❶ A is not correct because wave type doesn't affect direction. C is not correct because coastal sediment movement is part of a sediment cell. D is not correct because sediment shape is the by product of sediment movement, not the cause of the direction.	(1)

Question number	Answer	Mark
5(b)	AO3 (2 marks) Allow 1 mark for each correctly completed label • A: Sediment source / River sediment / sediment from cliff erosion ❶ • B: Longshore drift / Transfer ❶ Accept any other reasonable response	(2)

Question number	Suggest one reason for the cliff collapse. Answer	Mark
5 (c)	AO1 (2 marks)/AO2 (1 mark) Award 1 mark for analysing the resource to identify a feature that might cause the cliff collapse and a further 2 marks for explaining how that might affect coastal processes, for example: • Wet/dry weathering / sub-aerial processes break up the rock / exploit faults, joints ❶ weakening the cliff-face / reducing slope strength / increasing instability ❶ allowing any other stresses / gravity to overwhelm the stability of the cliff ❶ • Waves / marine erosion processes at the cliff base ❶ might have reduced strength of the slope ❶ by removing the base support / creating wave-cut notches ❶ • Sedimentary rock / chalk is quite soft / reacts quickly with water / dissolves quickly / vulnerable to carbonation ❶ so waves are more likely to erode quickly / undercut the cliff / create wave-cut notches ❶ weakening its stability ❶ • The rock has been saturated with water / rainfall ❶ increasing slope stress ❶ overwhelming / reducing the stability of the cliff ❶ • Bedding planes separate permeable and impermeable layers of rock ❶ and water infiltration saturates the permeable layer ❶ increasing weight / stress ❶ • Terminal groyne syndrome starves the beach ❶ removing a natural source of cliff protection ❶ increasing marine erosion at the base of the cliff ❶ • Road building / car transport ❶ might have caused vibration ❶ increasing stress on the cliff material ❶ Accept any other appropriate response.	(3)

Question number	Answer	Mark
5(d)	AO1 (4 marks) For each process, award 1 mark for each process and a further mark for an explaining how it operates on a coastline, for example: • Mechanical weathering puts pressure on cracks in rock 1 because of hydration / freeze-thaw / salt crystallisation / tree roots widen bedding planes in the rock 1 • Chemical weathering is a reaction with the rock / limestone dissolved by solution 1 because limestone rock is dissolved by more acidic water / rock reacts with oxygen in the air 1 • Biological weathering is the disintegration of rock 1 as microbes / fungi / algae which release chemicals that breakdown rock / minerals and then consume them 1 Accept definitions of biological weathering based on tree roots. Accept any other reasonable responses. Do not credit explanations solely about erosional processes.	(4)

Question number	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: • Coastal plains are sandy or estuarine, and are often found in areas of low relief in a low energy environment, facing onshore winds • Beaches may continue for miles, and are relatively low lying • This allows the build-up of sediment deposition, which may be stabilised by vegetation (e.g. marram grass in sand dunes) • There is likely to be a regular supply of sediment from both sea and land • Whereas, rocky coasts are characterised by erosion, usually of resistant rock by marine processes (e.g. Lands End Cornwall) resulting in high relief coastlines of harder rock, e.g. cliffs / wave cut platforms, and low relief coastlines of softer rock / discordant structure, e.g. headlands / bays. • There is little natural protection from the sea (small beaches) so distinctive landforms of erosion (headlands, plunging cliffs) are found, depending on lithology

	Accept any other reasonable response.	
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 importance of longer term sea-level change in explaining the risks at different 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 • Sea-level change could be the result of eustatic (ice formation / melting and thermal change) and isostatic (post glacial adjustment, subsidence, accretion) processes, /or linked to tectonic movement. It can result in emergent and submergent coastlines. • Long term sea-level change may be linked to climate change • Increased flood risk occurs due to local factors on some low-lying and estuarine coasts (e.g. height, degree of subsidence, vegetation removal) • Storm surge events can cause severe coastal flooding with dramatic short-term impacts AO2. • Eustatic sea-level change makes it harder for beach material to accumulate in bays because water continues to erode in bays as well as headlands, increasing flood risk • Isostatic change exposes rock for exploitation by wave energy, but equally can create raised beaches where coastline can't be eroded by sea, reducing flood risk. • More storms / intense storms linked to warmer periods might concentrate energy on headlands / stacks / arches and cause collapse and erosion, e.g. Gozo. Equally this might create beach material for bays, or scour beaches in bays of their beach material increasing flood risk. • Tectonic activity might be responsible for the addition of harder rock material that, over time, which might be exposed by the removal of surrounding softer rock. • Risk is also linked to human factors: adaptation/mitigation and education. Retreat from coastlines may be the only option (Maldives/Tuvalu), whereas

Question number	Assess the importance of longer term sea-level change in explaining the risks at different coastlines. Answer
	other communities build walls/use warnings (e.g. Florida before Hurricane Michael 2018) • Risk also linked to geology/lithology where it is not cost effective to stabilise the cliffs and prevent the effects of erosion worsened by a rising sea level (e.g. Barton, UK). Judgements might be based around the extent to which sea level rise is the dominant factor alongside other contributory reasons (wealth/geology). Depending on the locations chosen, many are likely to conclude that this is the most important factor. However, a falling sea level causes far fewer risks.

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)
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Question number	State one reason for studying sediment size Answer	Mark
6(a)(i)	A03 (1 mark) Award 1 mark for a correctly identified reason • To see how sediment size varies along a beach ❶ • Size of sediment reduces in the direction of longshore drift, so we can see how a spit is forming ❶ • Smaller size of sediment shows the impact of marine processes ❶ • To see which pebble sizes are transported ❶ Do not accept answers that don't refer to sediment size. Accept any other reasonable response.	(1)

Question number	Complete the table above by calculating the missing number in the table Answer	Mark
6(a)(ii)	A03 (1 mark) 25 ❶	(1)

Question number	Calculate the value of Chi ² for the data given. Answer	Mark
6(a)(iii)	A03 (1 mark) Award 1 mark for the correct final answer only. • $9+1+1.6+7.6$ = 19.2 ❶ Do not allow other answers.	(1)

Question number	Suggest one reason for carrying out a Chi ² test on this data set. Answer	Mark
6(a)(iv)	A03 (2 marks) Award 1 mark for suggesting a reason based on the fieldwork scenario and 1 additional mark for justification. • Because there are categories of data ❶ and Chi² establishes whether there is an uneven distribution pattern amongst these categories ❶ • Test for relationship / pattern ❶ between the number of pebbles above 5mm in length and their location at certain points along the beach ❶	(2)

	To determine if there is a pattern in the distribution of sediment size 1 because significance difference between the categories would indicate sediment sorting / longshore drift 1 Accept any other reasonable response.	
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Question number	Explain two primary fieldwork methods that might have been used to extend this investigation on spit formation Answer	Mark
6(a)(v)	AO3 (4 marks) For each type of fieldwork, award 1 mark for identifying a technique, and a further 1 mark for justification of why it extends the investigation: - Photographs / Field sketching 1 might help show the size / shape of the beach at different locations 1 - Comparing photographs to old maps/photos 1 to show change over time 1 - Using floats to establish longshore drift 1 to see if it's in the direction of spit growth 1 - Lithology measurements 1 might help investigate the origins of the beach material and how they've been transported 1 - Measure sediment shape / size using callipers / chart shape / sediment sieving (phi size) 1 to help to identify whether material is more angular / size changes along the beach 1 - Beach profiling shows beach size / shape / CSA 1 to identify if longshore drift has caused the spit to grow in a particular direction 1 - Measure wave type / wave frequency / wind speed / wind direction / number of waves 1 to establish if constructive waves are building up the beach 1 Accept any other appropriate response. Methods may refer to secondary data for comparison but must include a primary data collection method	(4)

Question number	Assess how the sampling procedures and sample size affected your results. Answer
6(b)	A03 (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. No marks for stating research question, but this should be used as the context for the answer. Indicative content guidance Content depends on students' choice of enquiry question and the research sources used. Content depends on students' choice of enquiry question and the research sources used. • Sampling procedures used should be explained (systematic / stratified / random, allow opportunistic/pragmatic) and justified with reference to the field research question. NB expect good answers to explain how sampling was done, e.g. explain random sampling procedure used. • Sample size could be considered in terms of numbers of people/locations/ transect/ point samples. Also the time of the day or week or year • Credit planning/research before going out to select a representative sample / locations for the visit (e.g. use of map/google image) • the area or population being sampled is likely to be a key factor in assessing the suitable method and the number sampled. • credit assessment of issues of bias and reliability linked to sampling procedures/strategy and locations of fieldwork data collection if appropriate • credit comments about time/cost/safety where linked to the specifics of the research question and the chosen location • credit assessment of size of sample in relation to chosen statistical technique for data analysis • Effects of these procedures on validity and reliability of results should be assessed.

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 effectiveness of the management strategies shown. 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 • Coastal landscapes include backshore, nearshore and offshore zones. Threats therefore also include economic and social losses because of dense coastal development • Threats to the coastline include those from coastal flooding, subsidence, and global sea level rise, pollution, tourism – these are caused by both climate change and tectonic movement, and human activity at coasts. • Sustainable coastal management involves countries developing holistic ICZM strategies and might lead to conflicts between different players. AO2 The management is effective because: • They have landuse zoning – reducing risk to vulnerable/valuable areas, e.g. the industrial zone • There are attempts to limit pollution to coral reefs, as well as the Marine Protected Area – and protecting coral reefs provides protection against storm surges • Pollution control ship can help, but will it be sufficient to limit the damage? • The ICZM might make it harder for any one user to dominate the landscape. It depends on how well it is enforced The management is not effective because: • The funnel shape of the Gulf of Aqaba might focus storm surges / coastal flooding at the city, particularly affecting the tourist zone – on the other hand there is a beach protection zone upto 150m inland, which although designed to limit development, also limits vulnerability • Tectonic activity might lead to subsidence (isostatic SLR), and this might be exacerbated by building work, and global SLR (eustatic)

Question number	Evaluate the effectiveness of the management strategies shown. Answer
	• Industrial growth is dependent the Port of Aqaba and container port, with associated risk of pollution and spillages. This damage is long-lasting, affects the coral reefs and associated diving, and might become more wide-spread after moving to the industrial zone – note that the earthquake epicentres have tended to be close to the industrial zone. • Tourism generates income and jobs, but produces huge amount of domestic and industrial waste (during construction). This threatens both the ecology (coral) and beauty of both artificial and natural beaches. • Diving: Many people visiting dive centres in the Marine Park Zone could overwhelm the ecosystem or ruin the experience for visitors. Damage to coral reefs is irreversible - however, Marine Protected Area status should limit number of visitors, and permit a focus on research Other threats exist which are not currently being addressed: • 1995 EQ showed the potential for tectonic hazards along the Dead Sea Transform fault and, although the magnitude and number of deaths was relatively low, landslides might also occur in the mountains, potentially cutting off access to key parts of Aqaba's infrastructure. • Some candidates might note there seems to be a delay to new developments and question whether the SEZ is continuing to grow – will it continue to be a threat? Judgements and conclusions might be based around whether the SEZ is ultimately the biggest threat to Aqaba's coastal landscape, or whether the management strategies proposed really solve the problem. Most candidates are likely to conclude that climate change / tectonics seem to be less significant factors, although tourism seems to be suffering for some reason. Sustainable management will depend on the extent to which all the players can work together to prevent overuse of the landscape. Most are likely to conclude this threat is the most significant.

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)

