Mark Scheme (Results)

Summer 2023

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

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General Marking Guidance

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

Paper 1 Mark scheme (v7 Standardisation)

Question number	Answer State one hazard caused by an earthquake.	Mark
1(a)	AO1 (1 mark) Award 1 mark for a correctly identified hazard: • Tsunami ❶ • Landslide / Rockslide ❶ • Avalanche ❶ • Crustal fracturing ❶ • Ground shaking ❶ • Aftershocks ❶ • Building collapse ❶ • Liquefaction ❶ • Fire ❶ Accept any other appropriate response, including some human impacts, e.g. disease / famine	(1)

Question number	Answer Compare the data about earthquakes before and after 2005.	Mark
1(b)(i)	AO3 (2 marks) Award 1 mark for each correctly identified comparison between the earthquake frequency before and after 2005. • There are more recorded earthquakes after 2005 ❶ • The highest magnitude earthquakes occur after 2005 ❶ • There are more years with a higher number of earthquakes after 2005 ❶ Accept any other correct comparison based on figure 1a.	(2)

Question number	Answer Suggest one reason why this data might concern the government of Iran and Iraq.	Mark
1(b)(ii)	AO1 (2 marks)/AO2 (1 mark) Award 1 mark for analysing the resource to suggest a reason for having concern, and a further 2 marks for justifying the possible reason, for example: • Frequency might affect more people ❶ who can report / need medical support / are increasingly vulnerability / whose buildings require protection / require hazard education ❶ stretching government resources / costing a lot more money ❶. • Increased frequency might make it hard to communities to recover after one earthquake before the next one strikes ❶ which affects vulnerability / resilience / capacity to cope / requires more support by the government to rebuild / prepare ❶ so more people might be injured / die / homeless ❶. • Increased frequency might create earthquake fatigue as communities get used to earthquakes ❶ which means they might struggle with resilience / preparations ❶ and might need more intervention by government to cope ❶. • The higher intensity earthquakes might affect more people ❶ because earthquake waves could travel to more isolated areas / cause more damage in densely populated areas ❶ requiring more government intervention to support rescue efforts / provide more direct action to reach areas that have been cut-off / better infrastructure is needed to prepare for inevitable further quakes ❶. • Increased frequency of earthquakes might hurt the reputation of the country / government because perception of threat level is higher ❶ so tourists are less likely to visit and bring income / people trust the government's capacity to cope less ❶ and reduces the government's ability to act to reduce the threat from future earthquakes ❶. • The earthquakes occur alongside ongoing conflict / warring factions ❶ so infrastructure / roads / hospitals are destroyed / damaged / in dis-repair ❶ making it difficult to treat / support affected communities ❶. Accept any other appropriate response based on figure 1a.	(3)

Question number	Explain two impacts of a tectonic mega-disaster. Answer	Mark
1(c)	AO1 (4 marks) For each reason, award 1 mark for explaining one impact of a mega-disaster and a further 1 mark for developing that explanation to explain why that impact matters region / globally, for example: Note, that a megadisaster is an extreme disaster which can <u>impact the region or globally, or has global significance (e.g. Haiti?)</u> • Disruption caused by tectonic hazards might disrupt economic systems / trade or aid ❶ because flights are delayed or cancelled / global TNCs make a loss / make significant changes to mode of production, e.g. ash in 2010 disrupted flights causing an estimated US$1.7bn of loss for the global airline industry. ❶ • A global areal extent means life might be significantly disrupted in multiple ~~developing~~ countries / significant number of lives are lost ❶ and human / economic / social vulnerability could be particularly high / significant international intervention / aid / insurance companies are required to support ❶ e.g. Guatemala 1976 killed 23,000 mainly in slum areas, e.g. Gujarat 2001 killed over 20,000 ethnic minority groups who had a poor capacity to copy (e.g. lacked emergency aid) • The areal extent might be so large that the tectonic event combines with other physical geographical factors ❶ which exacerbates the nature of the hazard (e.g. extremely sharp ash) / exacerbates the spread, e.g. ash carried by a jet stream across Europe ❶. • Volcanic ash / aerosols in the atmosphere can reduce global temperatures ❶ because sunlight is reflected / crops fail / prolonger wet and dry anomalies can occur in other parts of the atmosphere around the world ❶. • Decisions taken to mitigate the impact of a tectonic event by one country could affect another country ❶ because of interconnections / trade imports/exports might be affected, e.g., the 2011 Japan Tsunami impact on nuclear power ❶. Accept any other appropriate response, although do not accept responses that could simply refer to tectonic disasters. NB – this question does not require candidates to respond with located detail for named megadisasters. However – do allow extensions that refer simply to located detail if used as evidence of the global/regional impact.	(4)

Question number	Explain the global distribution of volcanic eruptions. 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: • Volcanic eruptions are found close to plate margins where upwelling magma breaches the crust. • The majority are found at destructive margins, because of melting magma at subduction zones and these tend to be the most violent. • 80% of active volcanoes are in the Pacific Ring of Fire because this is dominated by subduction zones. • Less violent, but more frequently erupting volcanoes are found at constructive plate margins where plates pull apart allowing molten magma to rise. • Conservative plate margins have no volcanic activity. • There are also hot spots such as Hawaii and the Galapagos where mantle plumes generate mid-plate eruptions, not related to plate margins. If no example named, the answer is unlikely to go out of level 2. Likely examples might include Iceland eruption in 2010. For Level 3, answers should be focussed on distribution i.e. the pattern of volcanoes.

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 effectiveness of strategies used to modify the impact of these earthquakes. 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 • Tectonic hazards can be managed by a variety of mitigation and adaptation strategies, which vary in their effectiveness. • Strategies to modify vulnerability and resilience include hi-tech monitoring, prediction, education, community preparedness and adaptation. • Strategies to modify loss include emergency, short- and long- term aid and insurance, and the action of affected communities. • Models can be used to forecast disaster impact • NGOs, insurers, the media and emergency services are some of the players involved in mitigating the impact of earthquakes. • Types of prediction including monitoring of seismic activity, which may give time to warn the population / evacuation. AO2 Strategies shown are effective: • The RedCross has provided shelter accommodation available, with clear mapping available on digital devices. However, the American Journalist suggests not all residents have taken advantage of the accommodation and are sleeping in tents still. • GPS monitoring is being installed along the fault ruptures, to monitor for future events – aftershocks seem to have been picked up well and communicated to the public. However, if earthquakes trigger secondary hazards communication to the public can vary considerably depending on the level of communication and physical location. • The USGS advice 'Drop/Cover/Hold on' seems to have been understood and well-acted on, given the number of deaths and injuries is quite low. However even in other similarly well prepared, developed countries, a high-magnitude earthquake can still cause a high number of injuries and deaths, e.g. Japan 2010.

Question number	Assess the effectiveness of strategies used to modify the impact of these earthquakes. Answer.
	• Emergency services and short-term aid seems to have been provided – e.g. military personnel / RedCross / restoration of power and water within 2-3 days. However, remoteness from major cities can often be a barrier, particularly in mountains areas if rockfalls block road access. • There has been a lot of investment in recovery (>£5bn) – well in excess of the amount of damage caused. However, it seems more might have been spent on the airbase, while the community continues to struggle. Strategies are not effective: • Although high-tech monitoring has been installed, e.g. ShakeAlert, it doesn't seem to have provided warning. However, the system has provided warning of an after-shock (journalists), and there seems to be an expectation that the public recognise the Drop, Cover HoldOn message (implying prior education). • Although relatively higher than the rest of California, not many people have insurance against earthquakes – the high property values mean insurance companies cannot provide policies that are affordable to most people. However, being away from major cities may make properties more affordable to insure in Ridgecrest. • The reaction to the lack of warning seems to have caused some damage to the reputation of the USGS. However, access to social media aids communication from the organisation to local people – an apology / transparency. Other factors affect the impact • Other strategies are not appropriate or necessary in this situation, e.g. engineering defences to protect against tsunamis, because of the inland location. • Prediction can be very difficult for earthquakes – forecasting plays a bigger role, and the high proximity of buildings on faultlines justifies significant investment in USGS research. Good answers will use the full range of the hazard response cycle, including the numerical data and commentary offered through the social media sources. Judgements will be based around whether one type of strategy is more effective than another – most noting that in this case modification of the event seems to have been the most effective, whilst strategies to modify vulnerability and modify loss have been relatively less effective – although in this part of California, party those to modify vulnerability (particularly monitoring) have been unusually ineffective – however an overall judgement might comment on California's context and therefore the ability of the society to have managed a relatively low-magnitude earthquake reasonably well.

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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	Identify which approach is the most likely to have been taken here. Answer	Mark
2(a) (i)	AO1 (1 mark) Award 1 mark for the correctly identified management strategy: • A - Multiple economic uses is correct ❶: because of the presence of roads, railway, quarries. B, Total exploitation is not correct: infrastructure development is not complete. C, Total protection is not correct: the environment has been exploited. D, Global legislative framework is not correct: this a local region. Allow any other reasonable response.	(1)

Question number	Calculate the length of line AB. Answer	Mark
2 (a) (ii)	AO3 (2 marks) Allow up to 2 marks for correctly calculating the length of the line AB, with working out. • 1 mark for working out, which could include: o Identifying correct length of AB on paper - 12.0 to 12.3cm ❶ o Identifying length of the scale - 1km = 1.7cm to 2cm, (depending on whether measurement is taken from the middle of the dot, far or near edges) ❶ o Calculating a scale conversion: 1cm = 0.5-0.58km ❶ • 1 mark for the final answer, e.g. 12 x 0.5 = 6 ❶ o Accept from 6.0 to 7.2km ❶ Allow 1 mark for error on paper measurement carried forward into the final calculation. Do not allow the second mark unless the answer is given to 1dp.	(2)

Question number	Answer Suggest one reason why this landscape might have value.	Mark
2(a)(iii)	AO1 (2 marks)/AO2 (1 mark) Award 1 mark for suggesting a reason for the landscape having value with a further 2 extension marks to explain how this value might be extracted / experienced: • Natural beauty is a tourist attraction / mountain railway creates income for local people ❶ as people from outside of Snowdonia can enjoy the wilderness landscape / tell other people about their experiences / spend money on nearby services ❶ / particularly if they are not able to walk / need to drive / cannot climb a mountain / need to stay in local hotels and campsites / visit local restaurants / which creates disposable income for local business owners ❶. • Mountain formation / glaciation have created unique landforms / it is a relict glaciated landscape ❶ which attracts scientists / researchers / fieldwork groups who are curious about the environment ❶ and want to better understand glacial processes ❶. • Opportunities for mining / quarrying / forestry / agriculture to create income / extracts raw materials of economic value ❶ as those products are sold to tourists / exported to other countries ❶ which enhances the reputation of North Wales industry / enables local people to spend money on other local services / sustains local economy ❶. • Historical farming / industrial systems ❶ which have altered the landscape in unique ways ❶ creating unique behaviours / cultural traditions which people want to preserve ❶. • The unique beauty of the landforms which attract tourists / poets / paintmakers / filmmakers ❶ results in unique infrastructure / buildings designed to improve its beauty / limit overuse ❶ so that it is preserved and enjoyed by future generations ❶. • The lack of widespread infrastructure / buildings might reduce the impact of light pollution ❶ attracting wildlife / people to enjoy the darker skies ❶ creating opportunities for local traders to benefit from tourism ❶.	(3)

	• The Cwms / Corrie lakes / tarns are freshwater biospheres ❶ which might attract unique wildlife and ecosystems ❶ creating opportunities for scientific research ❶. Accept any other appropriate response.	

Question number	Explain two natural causes of climate change. Answer	Mark
2(b)	AO1 (4 marks) For each reason, award 1 mark for identifying how a natural processes causes climate to change and a further mark expansion explaining how this process impacts on the temperature, up to a maximum 2 marks each. For example: • Sunspots / increased solar energy / sun's radiation output solar flares / coronal mass ejections / darker spots ❶ increase radiation emissions / higher surface temperatures ❶. • Volcanic eruptions / dust / ash / gas (SO_2) emitted into the atmosphere reflects radiation ❶ leading to a fall in global temperatures ❶. • Methane / carbon dioxide can be released from volcanoes ❶ which is a potential greenhouse gas that increases temperatures ❶. • Milankovitch cycles can change the shape of Earth's orbit / tilt of Earth's axis / wobble on it's axis ❶ which makes intensity of sunlight / closeness to earth increases / decreases temperatures ❶. • Eccentricity / Earth's orbit varies from circular to elliptical over 100,000 year cycles ❶ which means that less solar radiation is received in an elliptical orbit when the Earth is furthest from the sun ❶. • Obliquity / Earth's axis tilts, varying from 21.8° to 24.4° over a 41,000 year cycle ❶ which means that the intensity of sunlight at the poles varies, affecting seasonality of the climate (greater tilt = greater difference between summer and winter) ❶. • Precession – Earth wobbles on its axis over a 21,000 year cycle ❶ so the point on the earth which is closest to the sun varies ❶. • Positive feedback mechanisms cause temperatures to rise ❶ because methane release accelerates warming / ice melting reduces albedo ❶. • Negative feedback mechanisms cause temperatures to cool ❶ because increasingly cloudy skies can diminish global warming, / disrupt the thermohaline circulation ❶. Accept any other reasonable response.	(4)

Question number	Explain how glacial deposition landforms can help reconstruct former ice extent and movement. Answer
2(c)	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: • Recessional and terminal moraines show the history of ice extent and retreat. Ground moraine is made up of widely distributed till from wherever ice has removed material from. • The position of marginal fluvioglacial (kames) and glacial (lateral moraines) gives evidence of ice thickness via trim lines. • The alignment of drumlins and other sub-glacial features reveals evidence of the speed and direction of ice flow − terminal moraine will mark the limit of the impact of moving ice. • Till fabric analysis reveals details both of ice direction and the provenance of the ice through the presence of erratics. • Distinctions between ablation and lodgement till give evidence of ice speed and direction. Allow other reasonable explanations. To achieve level 3, geographical knowledge does not need to include location specific information.

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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 contribution of glacial meltwater in the formation of glaciated landscapes. Answer
2(d)	AO1 (3 marks)/AO2 (9 marks) Marking instructions Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the levels-based mark scheme below. Responses that demonstrate only AO1 without any AO2 should be awarded marks as follows: • Level 1 AO1 performance: 1 mark • Level 2 AO1 performance: 2 marks • Level 3 AO1 performance: 3 marks. Indicative content guidance The indicative content below is not prescriptive and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. Relevant points may include: AO1 • Glacial meltwater creates a wide range of fluvioglacial landforms including those in contact with ice (kames, eskers, kame terraces) as well as proglacial features (sandurs, proglacial lakes, meltwater channels and kettleholes). • Contemporary fluvioglacial landscapes are found in areas where glaciers currently exist: on the fringes of polar areas and in the many alpine environments, such as the Himalayas, the Rockies, South Island New Zealand, Iceland and the Andes. • Glacial landforms are the by product of processes of accumulation, ablation; the rates of these process vary over time. • Glacial processes include those that cause erosion, deposition. These processes create distinctive landforms. AO2 Glacial meltwater contributes greatly to the formation of glaciated landscapes • Glaciers produces a lot of meltwater which flows swiftly on, within, or a the base of the glacier over the bedrock floor − however this flow is subject to the pressure created by the glacier (e.g. it can flow uphill!). • Kames and eskers are produces at the margins (underneath, sides and furthest extent) of ice − both ultimately consisting of irregular mounds of sands and gravels have been deposited unevenly. However, the origin of that material is the by-product of glacial erosion. • Glacial meltwater plays a significant role streamlining, and sorting material that has been deposited. However, the role of water is a reflection of glacial mass balance and varies significantly from season to season and over a period of time. • Meltwater from ice may creates large outwash plains (sandur), characterised by multi-thread channels (braids) − but these features require lots of coarse debris, previously eroded by the glacier.

Question number	Assess the contribution of glacial meltwater in the formation of glaciated landscapes. Answer
	• Meltwater rivers can be dammed so that a lake forms, so meltwater deposits material at the bottom of the lake and a delta forms at the mouth of inflowing streams. On the other hand, the processes that cause the lake to be dammed could include landslides, or ice formation. Other threats to glacial landforms are more important than global warming • Glaciers are very effective at erosion, creating spectacular landforms including hanging valleys, ribbon lakes. However, in relict landscapes these landforms are characterised by glacial meltwater, sometimes creating unique landscape features (e.g. moonbows in Yosemite National Park). • Glaciers are very effective at transport and deposition. This creates many landforms, particularly depositional landforms e.g. moraine and glacial till. However, meltwater can saturate these landforms caused them to become unstable so they flow / slump into nearby hollows. • Global warming is also likely to increase mass movement events, e.g., avalanches in the Himalayas, as well as rock slides and landslides in areas of permafrost − which often cut off cut off access, e.g. Karakoram Highway. • Global warming in Alpine glaciated environments is caused the retreat of glaciers, and an increase in water supply for Asian countries, although overtime, this represents a concern for water supply as glaciers disappear which affects the quantity (and timing) of meltwater supplies, a concern for people, livestock and crops. • Glacial lake outburst floods, e.g. Lake Missoula − cover a larger area (landscapes) and occur over a much shorter time-frame. They have the capacity to devast infrastructure and landforms, including large ice caps − e.g., Iceland, or any settlements in the way, e.g. Peru 1941. There are other factors that might affect the contribution glacial meltwater makes • Warming increases meltwater − so kames are likely to be get bigger, with more material accumulating in front of a melting glacier. If meltwater increases suddenly, it's likely the amount of sorting will be lower. On the other hand, as the kames grow, more dammed meltwater might accumulate behind the kame, so lakes will grow. Material might be deposited in the lake instead. A kame delta might grow instead. • Climate variability (cooling) could cause a glacial surge − that would then destroy eskers / kettle holes / kame terraces, e.g. NW Canada. • Post-glacial river processes will often cut through kame terraces, along with moraines, eskers and kettle holes − often removing and transporting the materials, e.g. Cairngorms. Rivers might cut through a

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	kame, allowing a spillway for meltwater, and so material from the kame will be distributed over the valley floor. • Post-glacial deposition processes often fill in kettles holes with other sediments, e.g. peat − e.g. Scotland. • Tourism / trampling / soil erosion is a risk on eskers, as they are often a good vantage point, or dry route way over boggy terrain. Judgements should be based around whether meltwater is the most important factor that shapes glaciated landscapes. Some candidates might note that in these landscapes there are many other processes, and arguably erosion, transport and deposition processes play a larger role. Yet these influence and are influence by the role of meltwater. Equally other factors can influence meltwater and alter its impact on the landscape. Therefore, most are therefore likely to judge that meltwater is not the major contributor.

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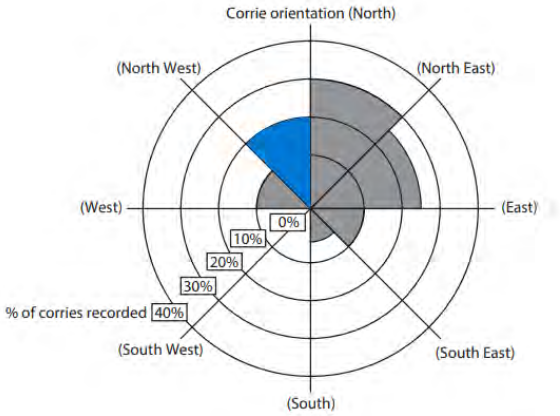
		some factors, to produce an argument that may be unbalanced or partially coherent. (AO2)
Level 3	9–12	• Demonstrates accurate and relevant geographical knowledge and understanding throughout. (AO1) • Applies knowledge and understanding of geographical information/ideas logically, making relevant connections/relationships. (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	Complete the rose diagram Answer	Mark
3(a)(i)	AO3 (1 mark) Award 1 mark for a correctly completed rose diagram. 	(1)

Question number	Identify the category that is the dominant orientation of corries. Answer	Mark
3(a)(ii)	AO3 (1 mark) Award 1 mark for the correctly calculated direction. • A, N-NE is correct. ❶ • B, C, D are all incorrect.	(1)

Question number	Identify the most suitable statistical technique. Answer	Mark
3(a)(iii)	AO3 (1 mark) Award 1 mark for the correctly identified statistical test. • A - Chi-Squared is correct – it potentially looks at the pattern in the dataset ❶. • B - Lorenz-Curve – inequality is not part of this study. • C - Spearman's Rank is not correct – there is not a relationship between two variables. • D - T-test is not correct – there are more than 2 datasets being compared.	(1)

Question number	Suggest a suitable hypothesis or key question that the students could investigated. Answer	Mark
3(a)(iv)	AO3 (2 marks) Award 1 mark for suggesting a hypothesis or geographical question that has a focus on at least one element of the scenario and a further 1 mark for extending by establishing the relationship to another element, for example: • Cirques facing NE are larger / wider / had bigger glaciers ❶ / because NE slopes are shaded from SW prevailing wind / snow is blown into smaller cirques on North/East / temperature and direction of the sun affects corries ❶. • There is a correlation between corrie / slope direction ❶ and evidence of corrie formation / ice movement / shaded or facing the sun ❶. • Slopes / Glacial valleys facing the NE are bigger / wider / steeper / ❶ because they're shaded from the sun rising in East / setting west / accumulation > ablation more of the day ❶. • There is no / significant difference between observed and expected ❶ patterns / orientation of corries in a particular direction ❶. • What is the reason for the pattern / why are most corries ❶ orientated in a particular direction / NE ❶? • How does the direction of the sun ❶ affect the orientation / size of corries / corrie lakes / cirques ❶? • Is the orientation of the corries ❶ similar to the evidence of overall direction of ice movement in the surrounding area ❶? • Does the elevation of land affect the number / distribution of corries ❶ because higher altitude would mean accumulation is more likely to > ablation ❶? Accept any other reasonable response.	(2)

Question number	Explain two primary fieldwork methods that might have been used to extend this investigation. Answer	Mark
3(a)(v)	AO3 (4 marks) Award 1 mark for explaining an extension to the investigation and a further expansion how this help investigate landform orientation mark of up to a maximum of 2 marks each. • Measuring the cross-section / height / size / shape / orientation of landforms ❶ because the direction they face / lie reflects the direction of ice movement ❶. • Mapping locates landforms in relation to each other ❶ because their proximity to each other reflects direction of ice movement ❶. • Annotated field sketches / photos ❶ because the size / shape / positions of landforms relative to other features reflects the direction of ice movement ❶. Accept any other appropriate response.	(4)

Question number	Assess the value of secondary data at different stages of your geographical investigation. 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. Secondary data might include: • Online sources, e.g. university or expert websites about the location, GIS data sources, newspaper articles, satellite imagery • Other reading might include Geography Review articles, Field Studies Centre backgrounds, • Other map resources might include 1:25,000 and 1:50,000 maps, previous field sketches, Geological Maps, including those available as software. Assessment could include the following: • Judgement about the extent to which secondary sources enabled the resulting geographical enquiry question were clear. • Qualification about the information's relevance and whether it helped understand or explore the enquiry question, i.e. if it helped plan the fieldwork, write hypotheses or explain the findings of the fieldwork. • Explanation about the value of the sources with appropriate links to how they help contextualise the geographical ideas being tested. • Sources of information and ideas should be clearly outlined with some supportive detail about relevance, data about the enquiry location, theoretical frameworks used to consider and plan possible fieldwork techniques. Some candidates might have been provided with baseline data, e.g. from field-studies centre or environmental monitoring networks. 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 extent to which the distinctive landscape in the St Elias-Wrangell mountain range is caused by tectonic activity. 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 • Subduction is a key plate tectonic process that operates destructive plate boundaries, where oceanic and continental plates meet – collision boundary processes may operate in combined situations. • The reasons for the present day distribution of high latitude ice sheets. • Temperate glaciers have faster rates of movement than polar glaciers. • The glacial mass balance system is based on the relationship between accumulation and ablation. • Glaciers alter landscapes through a number of erosion, transport and deposition processes. AO2 Tectonics creates the most change • The rate of uplift is very high, and partly the by-product of being on a convergent plate boundary. On the other hand, it is also the by-product of isostatic rebound. • The plate boundary movement is one of the fastest in the world, and the mountain range is one of the highest in the world too. However, this also creates ideal conditions for high precipitation / accumulation of snow and, therefore, glaciers to be formed. • Mt Wrangell is one of the largest shield volcanoes in world. However, it last erupted in 1902, and is being eroded by glaciers. • Tectonics is causing rock to be folded upwards, distorting the rock, building up stress and creating the conditions for earthquakes and landslides and avalanches. On the other hand, the material for these mass movements is the by product of glacial processes. • The high mountains and heavy precipitation are critical for glacier formation – however, glaciers are showing evidence of retreat, e.g. the Bering Glacier.

Question number	Evaluate the extent to which the distinctive landscape in the St Elias-Wrangell mountain range is caused by tectonic activity. Answer
	• The largest and most significant earthquakes are away from the mountain range and are more likely to be caused by tectonic processes along the coastline. Indeed, these events are also likely to create tsunamis. Tectonics does not – glaciation plays a bigger role • Glaciers play an active role in shaping the mountains and volcanoes to make them steep relief. However, glaciers have formed because of the height of the mountains – a by-product of tectonic activity. • The region's latitude makes it easy for moisture from the from the nearby Pacific Ocean can accumulate into some of the world's most powerful glaciers. On the other hand, the heat from volcanic activity is contributing to the basal melting / description of temperate glaciers and, in turn, towards high levels of erosion. • Changing glaciers are responsible for changing stress/pressure inside the rock that makes up the mountains – this introduces faultlines / lines of weakness, which can lead to earthquakes occurring. Equally, so is plate tectonics. • The overall height of the mountains shows glaciers are eroding the mountain faster than they can be uplifted. Tectonics and glaciation reinforce each other • The removal of rock from the mountains by glaciers, as well as melting of glaciers, creates strains on the rock, creating deformation, which allows the mountains to rebound. This might make it easier for ice to continue to accumulation, i.e. a potential negative feedback cycle. • As material is eroded by glaciers, the changing stress and pressure along faultlines in the rock can cause earthquakes, which eventually lead to landslides, causing further remove of rock from the mountains – i.e. a potential positive feedback cycle. Other processes might be more important • Prolonged summer periods can cause melting of both glaciers and permafrost. In turn these cause landslides, which change the angle of the mountain slope, further introducing faults into the rock that can cause more stress/release, causing more earthquakes, i.e. a potential positive feedback cycle. Judgements and conclusions might be based around whether tectonics or glaciation cause the most change in the St Elias mountains, although most will probably view glaciation as causing the most change. Ultimately, both tectonics and glaciation operate together in a series of feedback cycles, which might be recognised in the best answers – in which case tectonics might be seen as the more important, for creating the glaciated context in the first place.

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	Identify which approach is the most likely to be suitable for Portstewart Strand. Answer	Mark
5(a)(i)	AO1 (1 mark) Award 1 mark for a correct identifying the most suitable approach: • B − Dune stabilisation is the correct answer ❶ because sand dunes are clearly visible in the foreground of the image. • A − Offshore breakwater, C − Revetments and D − Sea wall are unlikely to be suitable as they would ruin the amenity value with little perceived need to spend so much money on protecting expensive buildings or infrastructure.	(1)

Question number	Calculate the length of line AB. Answer	Mark
5(a)(ii)	AO3 (2 marks) Allow up to 2 marks for correctly calculating the length of the railway, with working out. • 1 mark for working out, which could include: o Identifying correct length of AB on paper − 5.1 to 5.6cm ❶ o Identifying length of the scale - 1km = 1.7cm to 2.4cm, (depending on whether measurement is taken from the middle of the dot, far or near edges) ❶ o Calculating a scale conversion: 1cm = 0.42-0.58km ❶ • 1 mark for the final answer, e.g. 5.1 x 0.42 = 2.1 ❶ o Accept from 2.1 to 3.2km ❶ Allow 1 mark for error on paper measurement carried forward into the final calculation. Do not allow the second mark unless the answer is given to 1dp.	(1)

Question number	Suggest one way this landscape might have amenity value. Answer	Mark
5 (a)(iii)	AO1 (2 marks)/AO2 (1 mark) Award 1 mark for suggesting a reason why the landscape has an amenity this is valued with a further 2 extension marks to explain why it is valued: • The large sandy beach is an attractive location to visit / near a town ❶ so families / walkers / surfers / swimmers can enjoy recreationally / cars can be driven onto the beach ❶ so it is worth opening up for people to use / it is accessible / can spend money on local businesses ❶. • The sand dunes might create interesting / historic ecosystems and habitats ❶ that are interesting to hikers / scientists / conservationists who explore the environment ❶ so it is worth giving National Trust status / conserving / protecting species for future generations ❶. • The surrounding land is flat, open and accessible for walkers / cyclists / ❶ creating routes / national cycle routes to explore the landscape ❶ so it is worth ensuring road traffic is kept to a minimum ❶. • The skies are blue and it's sunny ❶ which attracts people to relax on the beach / walk near the sea ❶ and enjoy connecting with nature ❶. Accept any other appropriate response.	(3)

Question number	Explain two ways that geological structure influences coastal landforms. Answer	Mark
5(b)	AO1 (4 marks) For each reason, award 1 mark for explaining influence of structure and a further 1 expansion mark for explaining how that influences rates of coastal recession. • Headlands and bays form on discordant coasts / where there is a juxtaposition of hard/soft rock ❶ where bays erode faster than headlands ❶. • Coves often form on concordant coasts ❶ where rivers might have eroded softer rock / sea exploits soft rock behind hard rock ❶. • Unconsolidated / highly jointed or faulted rocks present many lines / planes of weakness ❶ along which agents of rock breakdown / weathering (e.g. water) can penetrate into the rock ❶. • Highly fractured / unconsolidated rock is less resistant to erosion ❶ with faults providing a line of weakness increasing recession / erosion rates ❶. • Complex cliff profiles are likely to experience mass movement ❶ because the layers of rock have different permeability / experience saturation increasing stress ❶. • If softer / less resistant rock at the base of a cliff is eroded faster caves will develop / sediment will be produced ❶ and eventually the overhanging rock will collapse / transported sediment will then be deposited elsewhere creating other landforms ❶. • Dip (angle) of rock layers affects erosion resistance / strength of the slope ❶ therefore the angle of the dip may allow quicker rates of erosion ❶. • At Haff coastlines, unconsolidated material deposited parallel to the coastline (e.g. Chesil Beach) ❶ can reduce the overall rate of recession ❶. Accept other valid explanations. Note: no credit for an explanation based on rock type or hardness (lithology).	(4)

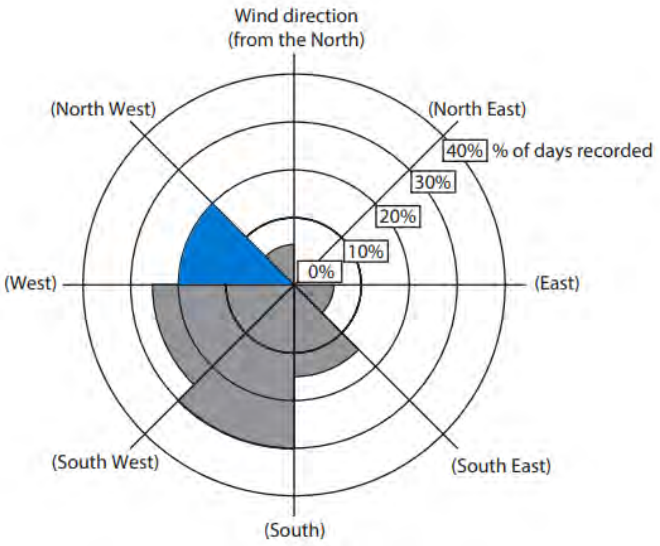
Question number	Explain how transport and deposition processes produce distinctive coastal landforms. Answer
5(c)	AO1 (6 marks) Marking instructions Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the levels-based mark scheme below. Indicative 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: • Beaches - an accumulation of sediment – reworked by waves and tides transporting and depositing material (longshore drift). They might be made more distinctive through features such as berms and beach cusps. • Spits are long, narrow ridges of sand and/or shingle that are attached to the land at one end – and often extend partly across an estuary. They might be made more distinctive by becoming hooked / recurved – either because there are two dominant directions of sediment transport (e.g. two dominant wind directions), or because wave refraction 'bends waves' around the tip of the spit and so causes the spit to become recurved e.g. Hurst Castle Spit. • If there are two dominant directions of wind either side of a harbor, Double spits are formed e.g. Chichester Harbour – a bar cannot form because tide scours away any deposits or the supply of sediment is not great enough to create a bar. Double spits can also be formed when a bar ponds freshwater and creates a lagoon. This subsequently breaches the bar and forms two 'spits' on either side of the breach such as Bembridge Harbour on the Isle of Wight. • If sediment transport elongates the spit from one side of the river channel to the other, a bar is created, with lagoon behind. In some situations, rising sea levels associated with the end of the last ice age have pushed or overwashed sediment landwards. In distinctive situations, freshwater the lagoon might be freshwater, e.g. at Slapton sands. • If the spit connects two landmasses, tombolos are formed – e.g. offshore islands refract approaching waves so that there is then a convergence of two directions of longshore drift on the opposite side of the island creating a tombolo that connects the island to the mainland e.g. St Ninian's Isle • Cuspate foreland also have ongoing debate as to their formation. One accepted process of formation is when longshore drift occurs in opposite directions with the sediment merging into a triangular protrusion along the coastline such as Dungeness in Kent. • Accept both micro and macro forms of sediment transport such as solution, saltation, traction, gravity settling as well as longshore drift and overwashing. Accept any other reasonable response. Because of the requirement to write about distinctive landforms, to achieve level 3, accurate geographical knowledge does not mean the response needs to include location specific information.

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 contribution of eustatic sea level change to the rate of coastal recession. Answer
5(d)	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 sea level changes result from both eustatic (ice formation / melting, thermal changes) and isostatic (post glacial adjustment, subsidence, accretion) change as well as tectonics. • Rapid coastal recession is caused by physical factors (geological / marine) but can be influenced by human actions • Climate change increases coastal flood risk − frequency/magnitude of storms, sea-level rise. Storm surges are a particular risk, because of their dramatic short-term impacts. • Local factors increase risk on some low-lying and estuarine coasts − a problem that is exacerbated by global sea-level rise. AO2 Eustatic sea level change makes a significant contribution to coastal recession • Eustatic sea-level rise exploits geological structure, strata and the pattern of jointing and faulting − exposing these cliffs to rock breakdown, marine erosion and consequently mass movement as swash reaches the base of the cliff. On the other hand, eroded material can absorb wave energy at the base of the cliff and halt the recession rate, temporarily. • Coastal retreat is irreversible. However, rates of recession are not constant − e.g. fetch / tides / seasons / weather systems mean there are usually opportunities for government to intervene. • 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 recession. On the other hand, isostatic uplift can create raised beaches and fossil cliffs where the coastline can't be eroded by sea.

Question number	Assess the contribution of eustatic sea level change to the rate of coastal recession. Answer
	There are other factors that contribute to an explanation of the rate of coastal recession: • Isostatic sea-level rise is a more significant factor in some locations, e.g. the south coast of Britain. However, combined with potential eustatic sea-level rise, the effects could leave some rural communities isolated, e.g. the damage to the coast road at Slapton Sands in 2018 / damage to the railway line at Dawlish Warren in 2017? • Technology and engineering constantly looks for new ways – and in some countries making 'Advance the Line' possible, e.g. Dubai. Managed realignment is possible in other situations, and can generate a healthy respect for nature, e.g. Criel sur Mer, Normandy. However, wealth and technology is not a guarantor of success – sea-level change is overwhelming some sea defences, e.g. Trinidad & Tobago. • Catastrophic change (winter storms) is a bigger threat than evolutionary change, e.g. Pacifica, California, or Glamorgan Heritage Coast, South Wales. • Lithology (and complex cliff profiles) is an important factor: metamorphic and igneous rocks have a lower rate of coastal recession than sedimentary and unconsolidated rock types. On the other hand eustatic sea level rise might deposit unconsolidated material in front of cliff faces (marine transgression, Haff Coastline), potentially lowering the rate of recession. • There are other threats, e.g. the removal of sediment inland before it reaches the coast causes problems in Guinea. However, climate change could precipitate a series of crises for a developing country that reduces the effectiveness of government to respond holistically. There are other coastal threats created by eustatic sea level rise, • Eustatic sea level rise inundates vulnerably low-lying islands, e.g. French Polynesia's 118 coral atoll islands – where some people might become climate change refugees. However, some of these islands are uninhabited, and others are struggling because for socio-political reasons, or refugees can adapt by moving to different islands. • Some cities have extremely high land value / installations – e.g. Shanghai, however their wealth means they are able to implement a hold the line policy to protect property. However, not all cities can, e.g. Mumbai risks upto $2150billion of property damage. Judgements might be based around whether eustatic sea level change makes a significant contribution to coastal recession. Most candidates will probably conclude that other factors are more important (e.g. mitigation / defence) whilst the impact of eustatic sea level change is more about coastal flooding – although some might note that the impact of eustatic sea level change varies locally, for a variety of different factors.

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	Complete the rose diagram. Answer	Mark
6(a)(i)	AO3 (1 mark) Award 1 mark for a correctly completed rose diagram. 	(1)

Question number	Identify the category that is the dominant wind direction. Answer	Mark
6(a)(ii)	AO3 (1 mark) Award 1 mark for the correctly identified direction. • A (South-SW) is correct ❶ • All of the other options are incorrect.	(1)

Question number	Identify the most suitable statistical technique. Answer	Mark
6(a)(iii)	AO3 (1 mark) Award 1 mark for the correctly identified statistical test. • Chi-squared is correct – it potentially looks at the pattern in the dataset ❶. • Spearman's rank is not correct – there is not a relationship between two variables. • T-test is not correct – there are more than 2 datasets being compared. • Lorenz-curve – inequality is not part of this study.	(1)

Question number	Suggest a suitable hypothesis or key question that the students could investigate. Answer	Mark
6(a)(iv)	AO3 (2 marks) Award 1 mark for suggesting a hypothesis or geographical question that has a focus on at least one element of the scenario and a further 1 mark for extending this by establishing the relationship to another element, for example: • The sediment moves along the beach ❶ towards the north-east / as a result of the dominant wind direction ❶. • Wind direction ❶ affects / influences the movement of coastal sediment ❶. • There is no / significant difference between observed and expected ❶ number of days / direction of the wind ❶. • There is a correlation between the direction of longshore drift / size of beach / sediment size ❶ and the dominant wind direction ❶. • The movement of coastal sediment ❶ is explained by theories of longshore drift / prevailing wind direction ❶. • Longshore drift direction / beach size changes / sediment size changes ❶ in different locations / as you move from SW to NE (W to E) / the dominant wind direction means swash is likely to come from that direction ❶. • Waves from the SW ❶ are more destructive / because more energy will have been transferred to the sea ❶. • Is there a difference between direction of dominant wind ❶ and coastal sediment movement ❶. • Will the average sediment size / lithology change ❶ as we move along the coast / go to different locations in Cornwall in SW England ❶. Accept any other reasonable response. Do not accept responses that have no reference to any element of the fieldwork scenario.	(2)

Question number	Explain two primary fieldwork methods that might have been used to extend this investigation. Answer	Mark
6(a)(v)	AO3 (4 marks) Award 1 mark for suggesting a suitable method and a further expansion mark up to a maximum of 2 marks each. • Beach profiles / cross-sections show the size/shape of the beach ❶ which reflects the direction/reason for sediment deposition ❶. • Sediment analysis / size / shape helps the direction of operation of coastal processes ❶ and in turn helps explain the origins of beach material / impact of longshore drift ❶. • Longshore drift measurements, e.g. painting pebbles helps determine the swash and backwash along the beach ❶ showing the direction of that sediment is transported in ❶. • Photographs illustrate / Field sketching produces a drawing to use as a guide ❶ to compare the importance of different coastal processes in different places ❶. • Use of quadrats to assess vegetation type / density ❶ to investigate the development of sand dune succession ❶. Accept any other appropriate response.	(2 +2)

Question number	Assess the value of secondary data at different stages of your geographical investigation. 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. Secondary data might include: • Online sources, e.g. university or expert websites about the location, GIS data sources, newspaper articles, satellite imagery • Other reading might include Geography Review articles, Field Studies Centre backgrounds, • Other map resources might include 1:25,000 and 1:50,000 maps, previous field sketches, Geological Maps, including those available as software. Assessment could include the following: • Judgement about the extent to which secondary sources enabled the resulting geographical enquiry question were clear. • Qualification about the information's relevance and whether it helped understand or explore the enquiry question, i.e. if it helped plan the fieldwork, write hypotheses or explain the findings of the fieldwork. • Explanation about the value of the sources with appropriate links to how they help contextualise the geographical ideas being tested. • Sources of information and ideas should be clearly outlined with some supportive detail about relevance, data about the enquiry location, theoretical frameworks used to consider and plan possible fieldwork techniques. Some candidates might have been provided with baseline data, e.g. from field-studies centre or environmental monitoring networks. 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 extent to which the distinctive coastal landscape of Costa Rica is caused by tectonic activity. 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 • Subduction is a key plate tectonic process that operates destructive plate boundaries, where oceanic and continental plates meet – collision boundary processes may operate in combined situations. • Rocky coasts (high and low relief) result from resistant geology, often in a high energy environment. • Coastal plain landscapes (sandy coasts) are found near areas of low relief and result from supply of sediment from different terrestrial and offshore sources, often in a low energy environment. • Bedrock lithology (igneous, sedimentary) are important in understanding rates of coastal recession. • Longer-term sea-level change can result from isostatic factors and tectonics. AO2 Tectonics is the biggest cause • The subduction of oceanic Cocos underneath the Caribbean plate creates uplift on the Caribbean plate (Fig 7b) • Volcanic activity, together with uplift, has formed the mountains and volcanoes that make up the Central America Volcanic Range (Fig 7a) However volcanic material is transported by rivers to form the sandy East coastal plain. • Uplift on the West coast is responsible for an emergent, rocky coastline – however the sea is responsible for the variety of rocky landforms along (mainly) the West Coast (Fig 7d) • More sudden uplift of sedimentary rock on the East coast has allowed marine abrasion processes to work and (yellow) sandy beaches to form, e.g. near Puerto Viejo (Fig 7c)

Question number	Evaluate the extent to which the distinctive coastal landscape of Costa Rica is caused by tectonic activity. Answer
	• Pyroclastic flows, ash and rock fragments are the result of pre-historic volcanic eruptions – and this rock has been eroded by river to create (black) sandy beaches on the east coast. (Fig 7c) • Erosion of the volcanic mountains by rivers, creates sediment that ultimately is then uplifted at the plate boundary (Fig 7c) Tectonics is not the biggest causes, other factors are more important: • The mixture of black and yellow sandy beaches is the result of marine abrasion processes and river erosion processes, – however tectonic activity is starting to lift some coral reefs beyond the reach of marine processes. – Fig. 7a + 7d • Although there are seasonally strong waves on the Caribbean coast, the fetch is much smaller than the Pacific Coast, which has strong waves all year round – perpetuating a rocky coastline. However, the reason for the small Caribbean fetch is the presence of the other Caribbean islands, which some might note are the by-product of tectonic activity. Fig 7a + 7c • Mixture of tectonic uplift and eustatic sea-level fluctuation creates a rocky coastline, exposed to coastal erosion and abrasion processes e.g. coastal terraces along the Osa Peninsular – Fig 7d • Eustatic sea level rise is exposes both coastlines to marine erosion, however these process interactive in tension with isostatic uplift. It depends on which coastline: • The Pacific Coast is more of a marine erosion coastline – it's mainly tectonics that has caused uplift, but the coastline itself is shaped by marine processes. • The Caribbean coast is more of a marine depositional coast - depositional processes play a significant role creating different types of beaches, but tectonic uplift exposes sedimentary rock to abrasion and other erosion processes – and the coastal plain itself is a by-product of tectonics. However, the Central Plain is more the by-product of pre-historic tectonic processes: coastal processes arguably dominate now, but these are shaped by the wave environment. Judgements and conclusions could be based around whether tectonics dominates coastal processes in Costa Rica. Some candidates will consider the question from the perspective of different time/scales. However, there is no easy distinction, except to consider each coastline in turn and most will probably conclude that although tectonics has created the context, coastal processes are now at work causing the most active change to the coastline.

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)