GCE AS MARKING SCHEME

SUMMER 2023

AS
GEOGRAPHY - COMPONENT 1
B110U10-1

INTRODUCTION

This marking scheme was used by WJEC for the 2023 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

GCE AS GEOGRAPHY

COMPONENT 1: CHANGING LANDSCAPES

SUMMER 2023 MARK SCHEME

Guidance for Examiners

Positive marking

It should be remembered that learners are writing under examination conditions and credit should be given for what the learner writes, as opposed to adopting an approach of penalising him / her for any omissions. It should be possible for a very good response to achieve full marks and a very poor one to achieve zero marks. Marks should not be deducted for a less than perfect answer if it satisfies the criteria of the mark scheme.

The mark scheme for this component includes both point-based mark schemes and banded mark schemes.

Point-based mark schemes

For questions that are objective or points-based the mark scheme should be applied precisely. Marks should be awarded as indicated and no further subdivision should be made. Each creditworthy response should be ticked in red ink. Annotations must reflect the mark awarded for the question. The targeted assessment objective (AO) is also indicated.

Banded mark schemes

For questions with mark bands the mark scheme is in two parts.

The first part is advice on the indicative content that suggests the range of concepts, processes, scales and environments that may be included in the learner's answers. These can be used to assess the quality of the learner's response. This is followed by an assessment grid advising on bands and the associated marks that should be given in responses that demonstrate the qualities needed in the three AOs, AO1, AO2 and AO3, relevant to this component. The targeted AO(s) are also indicated, for example AO2.1c.

Banded mark schemes are divided so that each band has a relevant descriptor. The descriptor for the band provides a description of the performance level for that band. Each band contains marks. Examiners should first read and annotate a learner's answer to pick out the evidence that is being assessed in that question. Once the annotation is complete, the mark scheme can be applied. This is done as a two-stage process.

Assessment Objective	Strands	Elements
AO1 Demonstrate knowledge and understanding of places, environments, concepts, processes, interactions and change, at a variety of scales.	N/A	This AO is a single element.
AO2 Apply knowledge and understanding in different contexts to interpret, analyse and evaluate geographical information and issues.	N/A	1a - Apply knowledge and understanding in different contexts to analyse geographical information and issues.
		1b - Apply knowledge and understanding in different contexts to interpret geographical information and issues.
		1c - Apply knowledge and understanding in different contexts to evaluate geographical information and issues
AO3 Use a variety of relevant quantitative, qualitative and fieldwork skills to: • investigate geographical questions and issues • interpret, analyse and evaluate data and evidence • construct arguments and draw conclusions.	1 - investigate geographical questions and issues	N/A
	2 - interpret, analyse and evaluate data and evidence	
	3 - construct arguments and draw conclusions	

Banded mark schemes Stage 1 – Deciding on the band

Beginning at the lowest band, examiners should look at the learner's answer and check whether it matches the descriptor for that band. Examiners should look at the descriptor for that band and see if it matches the qualities shown in the learner's answer. If the descriptor at the lowest band is satisfied, examiners should move up to the next band and repeat this process for each band until the descriptor matches the answer.

If an answer covers different aspects of different bands within the mark scheme, a 'best fit' approach should be adopted to decide on the band and then the learner's response should be used to decide on the mark within the band. For instance if a response is mainly in band 2 but with a limited amount of band 3 content, the answer would be placed in band 2, but the mark awarded would be close to the top of band 2 as a result of the band 3 content.

Examiners should not seek to mark candidates down as a result of small omissions in minor areas of an answer.

Banded mark schemes Stage 2 – Deciding on the mark

Once the band has been decided, examiners can then assign a mark. During standardising (marking conference), the qualities of each mark band will be discussed in detail. Examiners will then receive examples of answers in each mark band that have been awarded a mark by the Principal Examiner. Examiners should mark the examples and compare their marks with those of the Principal Examiner.

When marking, examiners can use these examples to decide whether a learner's response is of a superior, inferior or comparable standard to the example. Examiners are reminded of the need to revisit the answer as they apply the mark scheme in order to confirm that the band and the mark allocated is appropriate to the response provided.

Indicative content is not exhaustive, and any other valid points must be credited. In order to reach the highest bands of the mark scheme a learner need not cover all of the points mentioned in the indicative content but must meet the requirements of the highest mark band. Where a response is not creditworthy, that is contains nothing of any significance to the mark scheme, or where no response has been provided, no marks should be awarded.

The mark scheme reflects the layout of the examination paper. Mark questions 1 and 2 or 3 and 4 in Section A, all questions in Section B and all questions in Section C. If the candidate has responded to all questions in Section A, mark all these responses. Award the higher marks attained; further, possible rubric infringements will be discussed at the marking conference.

Be prepared to reward answers that give **valid and creditworthy** responses, especially if these do not fully reflect the 'indicative content' of the mark scheme.

Section A: Coastal or Glacial Landscapes

Either: Coastal Landscapes

1. (a) Use **Figure 1** to describe the characteristics of this coastal landscape. Content: 1.1.4 Skills: 8.2	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
					5		**5**

Indicative content

Most candidates will identify that there is evidence of erosion and that the cliff profile is steep.

- The cliffs appear unstable with evidence of sliding/slumping/mass movement. Students may link to sub aerial processes and wave attack to further exemplify the destabilisation of the cliff.
- A narrow and sandy beach is evident in the photograph with a gentle profile.
- Identification of lines of weakness in the rock which are evident, some may link to erosional processes such as hydraulic action.
- There is evidence of grass/vegetation/soil that may have been at the top, part way down the cliff face. Vegetation appears to be overhanging slightly at the top of the cliff.
- The material evident at the toe of the cliff is protruding seaward which indicates recent mass movement.
- Some may link the larger material (Sandstone rock fall) evident in the photograph and softer rocks (clays) to erosional processes such as abrasion which will accelerate cliff erosion.

Marking guidance

Do not credit detailed explanations of erosional processes.
Max Band 1 for a list.

Credit any other valid points.

Award the marks as follows:		
Band	**Marks**	
3	**4-5**	Clear description and identification of characteristics. A confident grasp of the different characteristics is shown and well derived from the resource.
2	**2-3**	Sound description linked to the coastal landscape characteristics. Statements are beginning to describe the characteristics with some depth.
1	**1**	Simple statements lacking in specialist terminology but may be linked to the resource. Limited use of the resource as a source of data.
	0	No valid comment.

1. (b) Examine the relative importance of geology in the formation of **one or more** landforms of coastal erosion. Content: 1.1.3	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
	7			3			**10**

Indicative content

Candidates should show knowledge and understanding that erosional landform formation is the result of the interaction of several factors, including rock structure and lithology.

The roles that rock structure and lithology play are crucial in the formation of several landforms e.g. caves, headlands, bays, arches, stacks, stumps, geos and wave-cut platforms. A number of factors combine to make lithology an important influence on coastal processes and landforms (hardness, chemical composition and permeability). Structure (geologically arranged) such as folding and faulting provides a range of rock types with different resistance to sub-aerial and marine processes. The amount of joints, bedding planes and faults influence the shape and distribution of landforms, development may examine shape of cliffs, types of weathering, mass movement etc.

AO1
Candidates should be able to demonstrate knowledge and understanding of the hardness, chemical composition and permeability of differing rock types as well as the rock structure (faults etc.) and how the rate of erosion will be affected and thus the landform.

Examples could include:

Lithology:
- Mineral composition can impact upon the type and rates of weathering – carbonates are easily dissolved, clay minerals are affected by wetting and drying, iron minerals are affected by oxidation
- Mineral composition impacts upon mass movement – rocks containing clay minerals are more prone to slumping and flows
- Variation in mineral composition within a cliff can lead to mass movement – bands of clay in a cliff are less permeable and build up pore water pressure to encourage slumping
- Hardness can impact on rate of cliff development – rocks that contain hard minerals erode less quickly, rocks with soft bonding minerals are easily eroded (stacks & arches)
- Cliffs with hard minerals in rocks are vertical (stacks & arches)
- Solubility of minerals impacts on type of weathering and erosion and can impact on shape of cliffs and landform creation (wave cut platforms).

Structure:
- Structure involves the disposition of rock and its bedding planes which determines its strength and the surface area exposed to wave erosion and sub-aerial processes. (shear strength/stress)
- Structure involves the jointing of rocks which will also impact on surface area and the physical resistance of rocks to erosion
- Faults or isolated master joints can be exploited by marine processes to form a range of landforms e.g. geos (minor landform)
- Folds also form weaker areas and can lead to the formation of wave cut platforms.
- Landforms will be clearly identified and must be erosional. Clear links must be made between the processes and the formation of the landform itself.

AO2
Candidates demonstrate application of knowledge and understanding through the examination of the role of lithology and rock structure in the formation of one or more erosional landforms. Relative responses may include an examination of:

- The relative importance of different rock structures in the formation of one or more landforms
- The extent to which the combined impacts of structure and lithology play a major role in determining erosional landform creation, especially where coasts are composed of 'hard rocks'
- The extent to which the role of rock structure and lithology can vary over time and in different places
- The relative importance of other contributing factors e.g. type of coastline, wave type etc.

Marking guidance

Some responses may use annotated diagrams which should be credited.

Credit any relevant landform.

Credit any other valid points.

Award the marks as follows:		
	AO1 (7 marks)	**AO2.1c (3 marks)**
Band	*Demonstrates knowledge and understanding of* geological factors *and their role in the formation of one or more coastal landforms.*	*Applies knowledge and understanding to examine the relative importance of geology in the formation of one or more coastal landforms.*
3	**5-7 marks** Demonstrates detailed and accurate knowledge and understanding through the use of appropriate, accurate and well-developed examples. Demonstrates detailed and accurate knowledge and understanding of geological factors and their role in the formation of one or more coastal landforms. Demonstrates detailed and accurate knowledge and understanding of the links between sub-aerial, erosional processes, rock strength and the landforms identified. Well annotated sketches / diagrams / maps may also be used and should be credited.	**3 marks** Applies knowledge and understanding to produce a thorough and coherent examination that is supported by evidence. Applies knowledge and understanding to produce a thorough and coherent examination of the relative importance of geology in the formation of one or more landforms chosen.
2	**3-4 marks** Demonstrates accurate knowledge and understanding through the use of appropriate and well-developed examples. Demonstrates accurate knowledge and understanding of geological factors and their role in the formation of one or more coastal landforms. Demonstrates accurate knowledge and understanding of the links between coastal processes and the landforms identified. Sketches / diagrams / maps may also be used and should be credited.	**2 marks** Applies knowledge and understanding to produce a coherent but partial examination that is supported by some evidence. Applies knowledge and understanding to produce a coherent but partial examination of the relative importance of geology in the formation of one or more landforms.
1	**1-2 marks** Demonstrates limited knowledge and understanding through a limited number of undeveloped examples. Demonstrates limited knowledge and understanding of geological factors and their role in the formation of one or more coastal landforms. Demonstrates limited knowledge and understanding of the links between coastal processes and the landforms identified. Basic sketches / diagrams / maps may be used and can be credited.	**1 mark** Applies knowledge and understanding to produce an examination with limited coherence and support from some evidence. Applies knowledge and understanding to produce a limited examination of the relative importance of geology in the formation of one or more landforms.
	0 marks Response not creditworthy or not attempted.	**0 marks** Response not creditworthy or not attempted.

2. (a) Use **Figure 2** to analyse the pattern of erosion along this coastline. Skills: 3.6	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
					5		**5**

Indicative content

There are patterns that can be identified but a spatial awareness is needed for band 3 i.e. an overall sense of pattern of erosion and use of compass directions with data.

- The whole stretch of coastline has suffered erosion of rates averaging over 2m per year.
- The further south along the coastline the rate increases at a maximum loss of over 5 m north of Spurn Head.
- Areas such as Bridlington in the far north appear to have experienced no erosion at all.
- South of Withernsea to Easington has suffered the most erosion with over 5m on average lost each year.

Credit any other valid points.

Award the marks as follows:		
Band	**Marks**	
3	**4-5**	Clear description of patterns of loss identified. Consistent and accurate use of the resource as a source of data to support the analysis. Not all areas of the graph need to be used to reach this band.
2	**2-3**	Some identification patterns of loss. Partial use of the resource as source of data to support the analysis.
1	**1**	Simple statements of varying validity. Limited use of the resource as a source of data.
	0	No valid comment.

2. (b) Discuss the view that human activity has a greater impact on coastal landscapes than natural processes. Content: 1.1.7, 1.1.8 & 1.1.9	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
	7			8			**15**

Indicative content

Human activities add a layer of complexity to the natural processes of coastal landscapes. These activities may have direct or indirect effects on changing coastlines and candidates may argue in a positive or negative way with developed examples. The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1
Candidates should demonstrate knowledge and understanding of the impacts of both natural processes and human activity on selected coastal landscapes.

Natural:

- Eustatic, isostatic and tectonic sea level change: major changes in sea level in the last 10,000 years.
- Recent and predicted climatic change and potential impact on coasts.
- The relationship between process, time, landforms and landscapes in coastal settings.
- Origin and development of landforms and landscapes of coastal erosion: cliffs and wave cut platforms, cliff profile features including caves, arches and stacks; factors and processes in their development.

Human:

- Human intervention in coastal landscapes. Traditional approaches to coastal flood and erosion risk: hard and soft engineering. Sustainable approaches to coastal flood risk and coastal erosion management: shoreline management/integrated coastal zone management.
- Case study of a coastal landscape to illustrate how it presents risks and opportunities for the population and evaluate impact.
- Responses may also consider development and economic activity taking place at the coastline. Provided there is a clear link to how this is shaping the coastal landscape this is a legitimate approach e.g. port, harbour development, tourism, industrial activity and coastal urbanisation.

AO2
Candidates demonstrate application of knowledge and understanding through an evaluation of the extent to which human activity has greater impacts on coastal landscapes. Relative responses may include a discussion of the following:

- The influence of both sets of processes being equal. Candidates are free to argue in any direction in relation to the question. Some may remain neutral.
- Some may argue human activity is having considerable activity upon coastlines. Coastal management can have a dramatic impact upon coastal landscapes. A variety of approaches may be considered in relation to hard engineering, soft engineering and managed retreat. Some may also legitimately consider the impact of coastal management in one place upon other stretches of coastline within the same sediment cell.
- Consideration of the cause of the erosional landscapes and features such as caves, arches, stacks and stumps are likely to feature. Responses taking this approach should consider the role of specific (natural) erosional processes such as abrasion, attrition, hydraulic action, and solution. Some aspects of geology may also feature. Similarly depositional features such as beaches and spits and the factors leading to their formation may also feature. Factors leading to the development of dunes are also permissible i.e. onshore winds, a sediment source and clearly developed intertidal zone.

- For eustatic change, more sophisticated responses may see the link between human activity and natural processes and consider these two elements in conjunction with each other i.e. that it is the human activity which is exacerbating the eustatic sea level change that is currently being experienced.
- Responses may also consider development and economic activity taking place at the coastline. Provided there is a clear link to how this is shaping the coastal landscape this is a legitimate approach.
- Responses are likely to be supported by specific examples to support the position taken i.e. places where natural processes have been dominant in shaping the landscape as compared with other places where human activity has been dominant in shaping the landscape.

Marking guidance

Those that score well will evaluate inter-relationships in the coastal environment. Evaluation may refer to positive impacts in one area leading to negative impacts in another. In Band 3 (AO2) there will be a substantiated conclusion that links clearly to the question.

Near the lower end, there will be limited evaluation. Answers that do not discuss negative impacts are limited to Band 1 (AO1) but could reach mid Band 2 (AO2) showing evidence of a partial/unbalanced discussion.

Credit any other valid points.

Award the marks as follows:		
	AO1 (7 marks)	**AO2.1c (8 marks)**
Band	*Demonstrates knowledge and understanding of the impacts of human activity and natural processes in the shaping of the coastal landscape.*	*Applies knowledge and understanding to evaluate the extent to which human impact is greater than the impacts of natural processes on the coastal landscape.*
3	**6-7 marks** Demonstrates detailed and accurate knowledge and understanding through the use of appropriate, accurate and well-developed examples. Demonstrates detailed and accurate knowledge and understanding of the impacts of human activity and natural processes at play. Well annotated sketches / diagrams / maps may also be used and should be credited.	**7-8 marks** Applies knowledge and understanding to produce a thorough and coherent discussion that is supported by evidence. Applies knowledge and understanding to produce a thorough and coherent discussion on the extent to which impacts of human activity on coastal landscape are more or less significant than natural processes. A substantiated conclusion will be evident.
2	**3-5 marks** Demonstrates accurate knowledge and understanding through the use of appropriate and developed examples. Demonstrates accurate knowledge and understanding of some of the impacts of human activity and coastal processes. Sketches / diagrams / maps may also be used and should be credited.	**3-6 marks** Applies knowledge and understanding to produce a coherent but partial discussion that is supported by some evidence. Applies knowledge and understanding to produce a coherent but partial discussion on the extent to which impacts of human activity on coastal landscapes are more or less significant than natural processes.
1	**1-2 marks** Demonstrates limited knowledge and understanding through a limited number of underdeveloped examples. Demonstrates limited understanding of some if the impacts of human activity and natural coastal processes. Sketches /diagrams / maps may be used and can be credited.	**1-2 marks** Applies knowledge and understanding to produce a discussion with limited coherence and support from some evidence. Applies knowledge and understanding to produce a limited discussion on the extent to which impacts of human activity and natural processes on coastal landscapes are significant.
	0 marks Response not creditworthy or not attempted.	**0 marks** Response not creditworthy or not attempted.

Or: Glaciated Landscapes

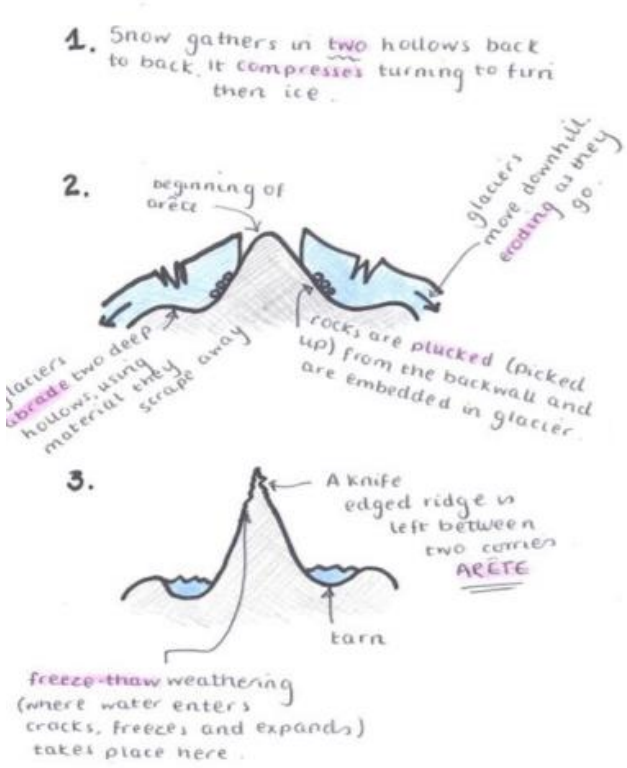
3. (a) Use **Figure 3** to describe the characteristics of this glaciated landscape. Content: 1.2.5 Skills: 8.2	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
					5		**5**

Indicative content

Arêtes are knife edge like ridges found between two corries. It is key to the question that an understanding of how corries are formed in order to fully describe how an arête is formed. As each glacier erodes a corrie either side of the ridge, the back wall of the corries become steeper and the ridge becomes narrower and higher. Some candidates may reference the U shaped valley and Tarn evident in he picture.
A good example is Crib Goch in Snowdonia or Striding Edge in the Lake District (resource image).

Marking guidance

Students may choose to use well annotated diagrams, such as:



Credit any other valid points.

Award the marks as follows:		
Band	**Marks**	
3	**4-5**	Clear identification and description of the feature and processes of formation from the resource. Wide use of the resource to support the description with terminology used confidently.
2	**2-3**	Some identification of the feature. Partial use of the resource to support the description of the processes involved. Some understanding but lacks depth and clarity in places
1	**1**	Basic statement to describe or simply names the landform. Limited use of the resource.
	0	No valid comment.

3. (b) Examine the relative importance of depositional processes in the formation of **one or more** glacial landforms. Content: 1.2.6	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
	7			3			**10**

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1
AO1 content encompasses knowledge and understanding of glacial deposition in the formation of glacial landforms. The content will depend on the landform chosen but there are a number of threads common for credit.

- A number of different landforms are produced by sediment being directly deposited by ice: moraines, erratic, drumlins and till sheets.
- Moraines: a terminal moraine is a ridge of till extending across a glacial trough. They are usually steeper on the up-valley side and tend to be crescent shaped, reaching further down the valley in the centre. These landforms mark the position of the maximum advance of ice and were deposited at the glacier snout. The steeper up-valley side is the result of the ice behind supporting the deposits and making them less likely to collapse.
- Erratics: an individual piece of rock, varying in size from a small pebble to a large boulder. Distinctive due to being composed of a different geology from that of the area they have been deposited. Eroded most likely by plucking, or added to the super-glacial debris by weathering and rock fall, in an area of one type of geology and then transported and deposited into an area of differing rock type.
- Fluvial-glacial deposition: consists of boulders, gravel, sand, silt and clay from ice sheets or glaciers. Transported, sorted and deposited by streams of water. The deposits are formed beside, below or downstream from the ice and include kames, kame terraces, outwash plains, and eskers.
- Corrie: plays a minor role in the formation and development of the landform.

AO2
Candidates demonstrate application of knowledge and understanding to examine the role of glacial deposition in the development of the landform. Relevant responses may include an examination of:

- The role of more than one depositional process in relation to each other e.g. glacial melt or retreat on the formation of a lateral moraine.
- The role of erosional processes
- The role of geology
- The role of glacial deposition in the context of other glacial and sub-aerial processes e.g. the plucking and super glacial debris by weathering and rock fall in the formation of erratics.
- The role of depositional processes over time in the formation and subsequent modification of the chosen landform e.g. till sheets.

Near the lower end, there will be limited examination of the processes involved in the formation of the landform.

Marking guidance

Some responses may use annotated diagrams which should be credited.

Credit any other valid points.

Award the marks as follows:		
	AO1 (7 marks)	**AO2.1c (3 marks)**
Band	*Demonstrates knowledge and understanding of the process of deposition in the formation of one or more glacial landforms.*	*Applies knowledge and understanding to examine the role of deposition in the formation of one or more glacial landforms.*
3	**5-7 marks** Demonstrates detailed and accurate knowledge and understanding through the use of appropriate, accurate and well-developed examples. Demonstrates detailed and accurate knowledge and understanding role of deposition in the formation of **one or more glacial** landforms. Demonstrates detailed and accurate knowledge and understanding of the links between processes and the landform/s identified. Well annotated sketches / diagrams / maps may also be used and should be credited.	**3 marks** Applies knowledge and understanding to produce a thorough and coherent assessment that is supported by evidence. Applies knowledge and understanding to produce a thorough and coherent examination of the role of deposition in the formation of **one or more** glacial landforms.
2	**3-4 marks** Demonstrates accurate knowledge and understanding through the use of appropriate and well-developed examples. Demonstrates accurate knowledge and understanding of the role of deposition in the formation of **one or more** landforms of glacial deposition. Demonstrates accurate knowledge and understanding of the links between processes and the landform/s identified. Sketches / diagrams / maps may also be used and should be credited.	**2 marks** Applies knowledge and understanding to produce a coherent but partial assessment that is supported by some evidence. Applies knowledge and understanding to produce a coherent but partial examination of the role of deposition in the formation of **one or more** landforms.
1	**1-2 marks** Demonstrates limited knowledge and understanding through a limited number of undeveloped examples. Demonstrates limited knowledge and understanding of the role of deposition as a process. Demonstrates limited knowledge and understanding of the links between processes and the landform/s identified. Basic sketches / diagrams / maps may be used and can be credited.	**1 mark** Applies knowledge and understanding to produce an assessment with limited coherence and support from some evidence. Applies knowledge and understanding to produce a limited examination of the role of deposition in the formation of **one or more** landforms.
	0 marks Response not creditworthy or not attempted.	**0 marks** Response not creditworthy or not attempted.

4. (a) Use **Figure 4** to analyse changes in the position of the glacier snout. Skills: 3.6	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
					5		**5**

Indicative content

Candidates should clearly identify the links between glacial retreat and the evidence provided in Figure 4. The evidence suggests that the glacier is clearly retreating over time.

- The most rapid rate of retreat appears to be from 1990-2013.
- Expect candidates to note that the earliest date appears to be 1958, after which date the glacier has advanced until 1990 with a rapid retreat to the last date of 2013.
- Glacier peaked at +90 but had retreated to -450 by 2013, a difference of 360.
- Overall, from the mid-1950s to 2013, the glacier has retreated.

Marking guidance

Some candidates will drift into explanation and this should not be credited.

Credit any other valid points.

Award the marks as follows:

Band	Marks	
3	**4-5**	Clear description of the quantitative evidence provided. Wide use of the resource as a source of data to support the description of the pattern. Not all features are needed to enter this band but there must be a reference to time and overall pattern. Sound use of terminology.
2	**2-3**	Some identification of the pattern of retreat with some use of data. Partial use of the resource as source of data to support the description of the pattern of retreat. Some understanding of the data presented.
1	**1**	Basic interpretation of the quantitative evidence provided, which makes limited use of data and evidence in support. Basic connection(s) between different aspects of the data and evidence.
	0	No valid comment.

4. (b) Discuss the view that meltwater is the most significant factor in glacier movement. Content: 1.2.3	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
	7			8			**15**

Indicative content

Glacier movement is very dependent on the ice to provide meltwater, which acts as a lubricant between the glacier ice and the bedrock. Glacier ice movement includes internal deformation, basal sliding, sub-glacial bed deformation, surge conditions, compressional and extensional flow.

AO1
The rate of glacier movement is controlled by many possible factors:

- Gravity
- Basal sliding
- The internal temperatures of the ice – allowing movement of one area of ice relative to another.
- Altitude: affects temperatures (decreases with altitude and therefore reduces speed of movement) and precipitation inputs (snow rather than rain).
- Slope gradient: the steeper the slope, the faster the velocity.
- Lithology: friction with hard, resistant rock will tend to restrain movement at the base and sides of the glacier.
- Size: the greater the glacier mass (ice thickness), the greater the potential velocity.
- Mass balance: the nature of this will determine not just the velocity but also whether the glacier is retreating or advancing; Because temperate (warm based) glaciers are more mobile, they are capable of much greater erosion, transportation and deposition than polar glaciers (cold based).

It is important to understand that rates of movement vary within the individual glacier, both laterally and vertically. The critical factor is friction between the glacier ice and the valley floor and sides. As a consequence, the part of the glacier moving fastest is its surface in the middle of the valley.

AO2
Candidates will apply knowledge in order to evaluate and develop a discussion of whether the relationship between glacier movement and meltwater is the most significant or. Responses may include the following:

- A discussion of the varying role of meltwater in movement in different types of glacier i.e. cold- and warm-based
- A discussion of the degree to whether other factors e.g. slope, altitude, lithology, size and mass balance are influential
- A discussion of the inter-relationships between each of these factors to influence glacier movement.

Marking guidance

In Band 3 (AO2) there will be a substantiated conclusion that links clearly to the question.

Near the lower end, there will be limited evaluation.

Credit any other valid points.

Award the marks as follows:		
	AO1 (7 marks)	**AO2.1c (8 marks)**
Band	*Demonstrates knowledge and understanding of the relationship between glacier movement and meltwater.*	*Applies knowledge and understanding to evaluate the extent to which meltwater is the most significant factor in glacier movement.*
3	**6-7 marks** Demonstrates detailed and accurate knowledge and understanding through the use of appropriate, accurate and well-developed examples. Demonstrates detailed and accurate knowledge and understanding of the links between glacier movement and the meltwater along with other factors that could influence glacier movement over time. Well annotated sketches / diagrams / maps may also be used and should be credited.	**7-8 marks** Applies knowledge and understanding to produce a thorough and coherent discussion that is supported by evidence. Applies knowledge and understanding to produce a thorough and coherent discussion on whether the relationship between glacier movement and other factors such as altitude are more or less significant than meltwater. A substantiated conclusion will be evident.
2	**3-5 marks** Demonstrates accurate knowledge and understanding through the use of appropriate and developed examples. Demonstrates accurate knowledge and understanding of some of the links between processes and glacier movement. Sketches / diagrams / maps may also be used and should be credited.	**3-6 marks** Applies knowledge and understanding to produce a coherent but partial analysis that is supported by some evidence. Applies knowledge and understanding to produce a coherent but partial discussion on whether the relationship between glacier movement and other factors such as altitude, are more or less significant than meltwater.
1	**1-2 marks** Demonstrates limited knowledge and understanding through a limited number of underdeveloped examples. Demonstrates limited understanding of the links between processes and glacier movement. Sketches /diagrams / maps may be used and can be credited.	**1-2 marks** Applies knowledge and understanding to produce an analysis with limited coherence and support from some evidence. Applies knowledge and understanding to produce a limited analysis and discussion on whether the relationship between glacier movement and other factors is significant.
	0 marks Response not creditworthy or not attempted.	**0 marks** Response not creditworthy or not attempted.

Section B: Tectonic Hazards

5. (a) Use **Figure 5** to describe social impacts of the eruption on Bali. Content 1.3.4 Skills: 8.2	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
					5		**5**

Indicative content

Social impacts could include:

- Deployment of emergency services to evacuate residents
- Deployment of emergency services to impose 12km exclusion zone
- Airport closure preventing residents/tourists from leaving the island
- Local residents at risk of death who have remained on the island
- Local residents will be distressed at the loss of homes and belongings
- Air quality may cause breathing problems e.g. Asthma.

Credit any other valid points.

Marking guidance

There are a wide variety of impacts that could be accepted but they should be evident in the resource and related to the immediate impacts of the eruption. Be wary of students overly commenting on tourists e.g can't get home for work etc.

Do not credit any economic or environmental impacts e.g. crops fail, loss of income etc.

Award the marks as follows:

Band	Marks	
3	**4-5**	Detailed description of two or more immediate social impacts with clear links made to evidence from the resources.
2	**2-3**	Some descriptive detail or could focus on one impact alone. Some links made to evidence from the resources.
1	**1**	Partial statements made with limited understanding of the immediate impacts of the eruption.
	0	No valid comment.

5. (b) Use **Figure 6** to analyse the pattern of sulphur dioxide (SO_2) emissions. Skills: 3.1	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
					5		**5**

Indicative content

Trend

- Trend of spread of SO_2 is to the north and south of Bali (approx. 50km)
- The further you travel away from Mt Agung the lower the concentration of SO_2

Specidfic descriptive statements may include:

- High concentration over Mount Agung.
- High concentration on the east coast of Bali.
- Low amounts of emissions in south Java and the Indian Ocean.
- Medium emissions south west of Mount Agung and over the Indian Ocean.

Marking guidance

For Band 3 identification of overall geographical trend/pattern must be evident. Expect use of compass directions and scale.

Credit any other valid points.

Award the marks as follows:

Band	Marks	
3	**4-5**	Detailed analysis of the overall trend of direction of travel. Clear links made between evidence from the resource and patterns.
2	**2-3**	Some detail and/or a focus on limited evidence from the resource. Some links made to evidence from the resource.
1	**1**	Partial statements made with limited understanding of the patterns of the emissions.
	0	No valid comment.

6. (a) (i) Use **Figure 7** to calculate the mean velocity of the tsunami wave as it travels from the epicentre to Midway Island. Show your working. Give your answer correct to the nearest whole number. Insert your answer into the highlighted cell in **Figure 7**. Content: 1.3.6, 1.3.7 Skills: 2.5	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
					2		**2**

Indicative content

4100÷302 (1)
x60 = 814. (57) (1) 815 (1)

Award one mark only for the correct answer where there are no workings shown.

6. (a) (ii) Use **Figure 7** to calculate the **median** mean velocity of the tsunami wave. Content: 1.3.6, 1.3.7 Skills: 2.9	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
					1		**1**

Indicative content

760 km/hr (1)

6 (a) (iii) Use **Figure 7** to calculate the range in the heights of the tsunami waves. Show your working. Content: 1.3.6, 1.3.7 Skills: 2.10	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
					2		**2**

Indicative content

2.26-0.21 (1)
= 2.05 metres (1)

6.(a) (iv) State **one** suitable cartographic (mapping) technique for representing the length of time for the tsunami wave to travel to the locations in **Figure 7**. Skills: 3.1	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
					1		**1**

Indicative content:

Accept isolines (across the Pacific) OR Isopleth.
Do not accept proportional circles/line graph/located bar charts/choloropleth

6. (a) (v) Use **Figure 7** to analyse the nature of the relationship between the length of travel time and the heights of the tsunami waves. Skills: 2.5	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
					4		**4**

Indicative content:

- There is not an overall strong relationship between the variables
- Overall trend is as the travel time increases, height of tsunami wave increases.
- Valparaiso with longest arrival time (1335 minutes) does not have the highest wave height at 1.54m
- Midway Island with the shortest arrival time (302 minutes) does not have the lowest wave height at 1.27m
- Vanuatu is an anomaly with 596 minutes arrival time and only a 0.69m wave height
- Galapagos with the second longest travel time but the highest wave height.

Award the marks as follows:

Band	Marks	
3	**4**	Detailed analysis of the overall trend of travel time and tsunami height. Clear links made to evidence from the resource and states there is no clear relationship but a general trend.
2	**2-3**	Some detail and/or could focus on limited evidence from the resource. Some anomalies identified between height and travel time.
1	**1**	Partial statements made with limited understanding of the relationship.
	0	No valid comment.

6. (b) Explain how underwater earthquakes may produce tsunamis. Content: 1.3.6	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
	6						**6**

Indicative content

- Usually, it takes an earthquake with a **Richter magnitude** exceeding 6+ to produce a destructive tsunami when the rupture occurs under the ocean or in a coastal zone
- Most tsunamis are generated by a shallow focus earthquake at subductions zones (sea bed to be raised). This creates significant vertical displacement of the water above (72% of tsunamis). More than 80% of the world's tsunamis occur in the Pacific along its Ring of Fire subduction zones
- Underwater landslides created by an earthquake can cause tsunamis (10%)
- Not all underwater earthquakes cause tsunamis.

Award the marks as follows:

Band	Marks	
3	**5-6**	Detailed knowledge and understanding of the processes involved. Clear explanation of the link between magnitude and rupture. In this band students are expected to recognise that not all underwater earthquakes cause tsunamis.
2	**3-4**	Sound understanding is shown with some detail and/or specialist terminology e.g. subduction zone. Factors may be identified with limited development.
1	**1-2**	Partial statements made with limited understanding.
	0	No valid comment.

6. (c) Examine the role that quality of governance can play in reducing the risks from earthquakes. Content: 1.3.7, 1.3.9	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
	10			5			**15**

Indicative content:

Candidates are likely to comment on the role national governments and international governance agencies e.g UN can play as the key organisational stakeholder in most countries that has the resources to respond to a seismic event and the contrasting access to resources. For example a country such as USA which has strong federal and state governance and the state of California is a major player in risk reduction.

The lack of strong central governance produces a weak organisational structure. Equally, a lack of financial institutions inhibits disaster mitigation and both emergency and post-disaster recovery, increasing social and economic risks. A strong government leads to highly efficient rescue in the immediate aftermath of an earthquake e.g. China earthquake 2008 and thus reducing the risk to life. Haiti earthquake 2005 is an example of cumulative impacts of poor quality political decisions over a number of years which increases risk over time.

AO1
Candidates should demonstrate knowledge and understanding of tectonic hazards (earthquakes) and a variety of government responses short and long term. This is set within the context of hazard monitoring, predicting and warning, vulnerability and loss. Responses may include the following:

- Knowledge and understanding of quality of governance as an influencing factor in reducing the risks from earthquakes. Expect contrasting examples of effective risk reduction and mitigation such as the earthquake in 2011 in north-east Japan, and poor risk reduction in Haiti 2010.
- Knowledge and understanding of how effective governance can modify vulnerability through preparedness. Both engineering and community training and planning may be discussed as well monitoring, prediction and warning e.g. Japanese school children taking part in earthquake drills
- Candidates may reference international governance, such as the UN and associated agencies.

AO2
Candidates should demonstrate application of knowledge and understanding through an examination of the extent to which quality of governance reduces risks posed by earthquake events. Possible approaches could include:

- An examination of whether effective decision making by different governments has significantly impacted levels of risk and vulnerability over space and/or over time e.g. Japan (2011) and Haiti (2010). The latter example could be used to make the valid point about the level of development directly affecting the resourcing a government is able to offer hazard mitigation. Candidates may also suggest that the ability to reduce risks can vary within countries; even a developed country such as Italy can have poor mitigation strategies (in some areas) and thus tectonic risks remain high for the population
- An examination of quality of governance vis á vis other factors such as:
  - the role of NGOs, community organisations and individual households in reducing risk
  - magnitude of the event
  - geographical factors including location (urban/rural), time of day
  - population density.

Marking guidance

For Band 3 (AO2) candidates should sustain a clear analysis that is developed and convincing with detailed evaluation offering secure judgements. There will be a substantial conclusion that links clearly to the question. Credit any other valid points.

Award the marks as follows:

	AO1 (10 marks)	AO2.1c (5 marks)
Band	*Demonstrates knowledge and understanding of different governential responses in reducing risks of earthquakes.*	*Applies knowledge and understanding to evaluate the significance of quality of governance in reducing risks posed by earthquake events.*
3	**8-10 marks** Demonstrates detailed and accurate knowledge and understanding through the use of appropriate, accurate and well-developed examples. Demonstrates detailed and accurate knowledge of governential responses and other factors involved in risk reduction, including other key stakeholders involved. Well annotated sketches / diagrams / maps may also be used and should be credited.	**4-5 marks** Applies knowledge and understanding to produce a thorough and coherent assessment that is supported by evidence and case study examples. Applies strong evaluation of the different factors involved in risk mitigation as well as an assessment of development levels and access to resources. A substantiated conclusion will be evident.
2	**4-7 marks** Demonstrates accurate knowledge and understanding through the use of appropriate and developed examples. Demonstrates accurate knowledge and understanding of the risks associated for countries at different levels of development and resources available. Sketches / diagrams / maps may also be used and should be credited.	**2-3 marks** Applies knowledge and understanding to produce a coherent but partial assessment that is supported by some evidence. Applies knowledge and understanding to produce a partial analysis of the different factors involved in risk mitigation over time.
1	**1-3 marks** Demonstrates limited knowledge and understanding through a limited number of underdeveloped examples. Demonstrates limited understanding of the processes affecting the risks associated with earthquakes. Sketches /diagrams / maps may be used and can be credited.	**1 mark** Applies knowledge and understanding to produce an assessment with limited coherence and support from some evidence.
	0 marks Response not creditworthy or not attempted	**0 marks** Response not creditworthy or not attempted

7. (a) Discuss the view that secondary effects of volcanic activity present greater long-term threats than primary effects. Content: 1.3.4, 1.3.7, 1.3.8	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
	7			7			**14**

Indicative content

If threat is measured by amount of destruction, greatest loss of life and longest recovery time, then it is likely that most will argue secondary hazards pose the greatest threat. It is generally accepted that the secondary effects of a volcanic eruption pose the greatest danger to people. However, there are still examples in history where the primary effects of a volcanic eruption have been more deadly than what is usually expected of a volcano.

Candidates make take a variety of approaches with regards to interpretation of primary and secondary effects.

AO1
Candidates should show knowledge and understanding of the primary and secondary impacts of volcanic activity. There is likely to be a brief distinction made between the two types of hazard. Primary effects are immediate and arise directly out of the event. Secondary effects are triggered as a result of the primary effects and occur in the aftermath of a volcanic eruption.

- Primary impacts may include: immediate loss of life (suffocated by carbon dioxide), crops damaged and water contaminated by ash, houses and business destroyed by lava flows etc.
- Secondary effects may include: Mudflows (lahars) when volcanic material mixes with water (rainfall) which increases the death toll, fires started by lava flows, food shortages, homelessness etc. These effects could be categorised as, environmental, social, economic, and political. Whilst tsunamis are more associated with seismic activity under sea water, they can be triggered by volcanic eruptions also. There is also a known and clear link to climate change associated with eruptions. Ash clouds from the Pinatubo were shown to reduce global temperatures by up to 1C.

AO2
Candidates should demonstrate application of knowledge and understanding through a discussion of the extent to which secondary effects of volcanic activity present the greatest long-term threats. Possible approaches could include a discussion of:

- How historically it is the secondary effects which have proven most deadly, even generating global effects. Candidates will likely debate whether these are short- or long-term impacts, dependent on the impact discussed
- The threats associated with primary hazards. The main primary hazards are pyroclastic flows. These are accepted as the deadliest of the primary hazards responsible for thousands of deaths worldwide. They are impossible to avoid if a person is in the vicinity this is because they travel with great speed and are highly destructive. In the longer-term, pyroclastic flows can destroy vast areas, altering them in the long-term. Candidates will likely debate whether these are short- or long-term impacts, dependent on the impact discussed
- The other hazards of lava flows, volcanic gases and tephra generally cause less deaths. Lava flows are easier to avoid in some cases. (expect references to basic and acidic lava here). Tephra is highly dangerous and may bury farmland, infrastructure etc. and may cause breathing difficulties. Volcanic gases are deadly but only in rare circumstances do they cause death. Some may argue that threats to people include ash fall on farmland as well as destruction of property by lava flows. This is a legitimate approach.
- Lahars are triggered in circumstances where there is rapid ice melt following an eruption. These are perhaps the deadliest of all secondary hazards. Some will point to the effect of the Nevado del Ruiz, Pinatubo or Mount St Helens eruptions in this regard, though it should be noted that these are not contemporary examples. Floods may also be considered in this context.
- Some may point to the substantial economic costs associated with the generation of ash clouds, particularly if air travel is disrupted. e.g. Iceland 2010

- At the top end of Band 3 candidates may consider contrasting effects, both primary and secondary across the development continuum. Expect a discussion concerning contrasts between MEDCs and LEDCs regarding effects of volcanoes. Geographical variations in exposure and vulnerability help explain differences in degree of effect, primary and secondary.
- Some may also consider the global effects of a super eruption. Such an event is likely to present catastrophic primary effect in the region but also in terms of the global climatic impact.

Marking guidance

Credit any other valid points.

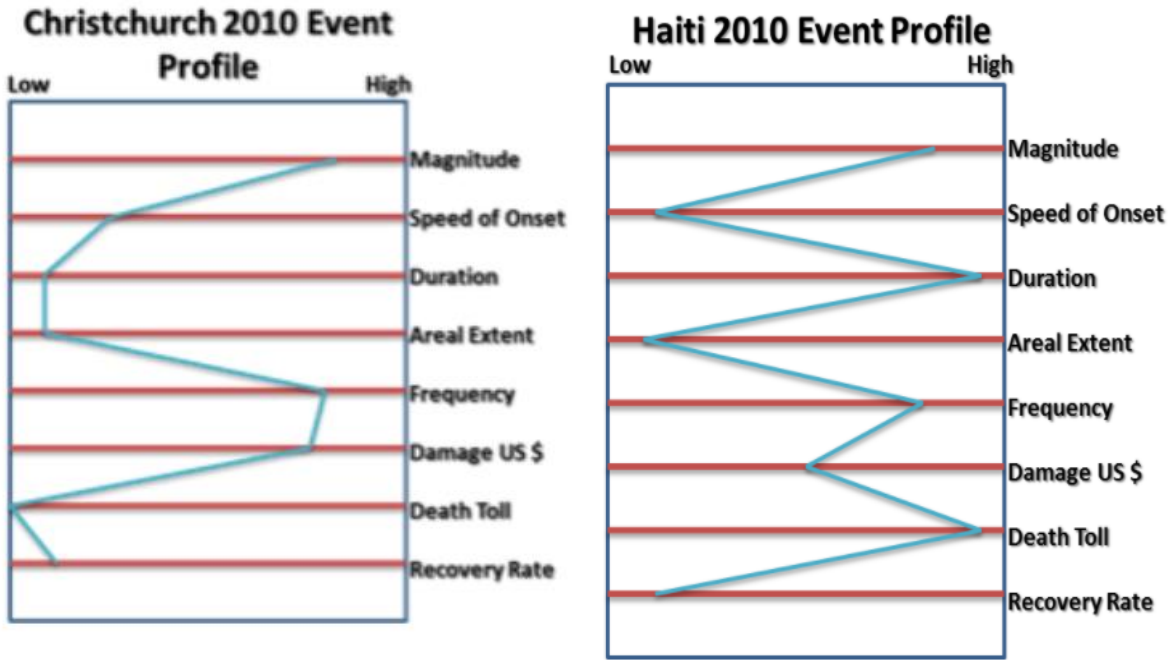
Award the marks as follows:

	AO1 (7 marks)	**AO2.1c (7 marks)**
Band	*Demonstrates knowledge and understanding of primary and secondary effects and link to the global pattern of volcanic activity over time.*	*Applies knowledge and understanding to evaluate whether the secondary effects of volcanic activity present greater long-term threats than primary activity.*
3	**6-7 marks** Demonstrates detailed and accurate knowledge and understanding through the use of appropriate, accurate and well-developed examples. Demonstrates detailed and accurate knowledge of the impacts short and long term. Well annotated sketches / diagrams / maps may also be used and should be credited.	**6-7 marks** Applies knowledge and understanding to produce a thorough and coherent assessment that is supported by evidence. Applies knowledge and understanding to fully assess the severity of the effects of both primary and secondary hazards over time. A substantiated conclusion will be evident.
2	**3-5 marks** Demonstrates accurate knowledge and understanding through the use of appropriate and developed examples. Demonstrates accurate knowledge and understanding of the processes affecting the effects over time. Sketches / diagrams / maps may also be used and should be credited.	**3-5 marks** Applies knowledge and understanding to produce a coherent but partial assessment that is supported by some evidence. Applies knowledge and understanding to partially assess the severity of the effects of both primary and secondary hazards over time.
1	**1-2 marks** Demonstrates limited knowledge and understanding through a limited number of underdeveloped examples. Demonstrates limited understanding of the processes affecting the effects over time. Sketches /diagrams / maps may be used and can be credited.	**1-2 marks** Applies knowledge and understanding to produce an assessment with limited coherence and support from some evidence.
	0 marks Response not creditworthy or not attempted	**0 marks** Response not creditworthy or not attempted

7. (b) Evaluate the usefulness of the physical hazard profile when comparing tectonic hazard events. Content: 1.3.2	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
	10			10			**20**

Indicative content

The focus of the question is the usefulness of the physical hazard profile to compare the characteristics of earthquakes, volcanoes and tsunamis (magnitude, speed of onset and areal extent, duration, frequency and spatial predictability).



AO1

Candidates should show knowledge and understanding of the physical hazard profile as used to analyse tectonic hazard events.

- The profile scores various characteristics of any given physical hazard (for example, duration and frequency). Profiles can be used to compare multiple aspects of different hazards (or different types of the same hazard, e.g. volcano). Candidates will likely show knowledge and understanding of these various characteristics linked to specific events studied e.g. Christchurch earthquake.
- Hazards with the following characteristics present the highest risk:
  - high magnitude, low frequency events – these are the least 'expected' as, by definition, they are unlikely to have occurred in living memory
  - rapid onset events with low spatial predictability – they could occur in numerous places and without warning
  - regional areal extent – affecting large numbers of people in a wide range of locations.
- Arguably, major earthquakes at subduction zones and collision zones are the most dangerous tectonic hazards. They can have magnitudes of 8-9, cannot be predicted and could occur along any of tens of thousands of kilometres of plate margin, instantaneously.

AO2
Candidates should demonstrate application of knowledge and understanding through an evaluation of the usefulness of the physical hazard profile when comparing tectonic events. Possible approaches could include:

Positives:
- Provides structure to rank and compare characteristics that all hazards share
- Helps identify and rank hazards
- Allows for specific management options to be considered
- Identifies hazards that require the most resources and attention
- Useful for comparing similar hazards e.g. Haiti earthquake & Christchurch earthquake.

Limitations:
- Reliability when comparing different events is limited due to subjectivity. There is difficulty comparing across hazards as a result
- The reliability of data should be considered depending on the spatial context e.g. contrasting data collection across the development continuum (Haiti and Christchurch).
- It could be argued that for planning it is better to consider hazards as individual events.
- Expect a discussion around the difficulty of comparing the magnitude of volcanic eruptions and that of earthquakes.
- Candidates may raise the problematic nature of comparing events over time as data recording improves year on year.

Marking guidance

Expect candidates in Band 3 to identify limitations of hazard profiles when countries are planning and preparing for tectonic events as each represents an individual event. Candidates may note that what has gone before might not necessarily happen in the same way in the future.

Award the marks as follows:		
	AO1 (10 marks)	**AO2.1c (10 marks)**
Band	*Demonstrates knowledge and understanding of ways of using hazard profiles to analyse tectonic hazard events*	*Applies knowledge and understanding to discuss the extent to which hazard profiles are a useful way to compare tectonic hazard events.*
3	**7-10 marks** Demonstrates detailed and accurate knowledge and understanding through the use of appropriate, accurate and well-developed examples. Demonstrates detailed and accurate knowledge and understanding of physical hazard profiles in the analysis of tectonic hazard events. Well annotated sketches / diagrams / maps may also be used and should be credited.	**7-10 marks** Applies knowledge and understanding to produce a thorough and coherent assessment that is supported by evidence. Applies knowledge and understanding to produce a thorough and coherent discussion of the extent to which hazard profiling is a useful tool to compare a variety of tectonic hazards. A substantiated conclusion will be evident.
2	**4-6 marks** Demonstrates accurate knowledge and understanding through the use of appropriate and developed examples. Demonstrates mostly accurate knowledge and some understanding of physical hazard profiles in the analysis of tectonic hazard events. Sketches / diagrams / maps may also be used and should be credited.	**4-6 marks** Applies knowledge and understanding to produce a coherent but partial assessment that is supported by some evidence. Applies knowledge and understanding to discuss the extent to which hazard profiling is a useful tool to compare tectonic activity.
1	**1-3 marks** Demonstrates limited knowledge and understanding through a limited number of undeveloped examples. Demonstrates limited understanding of hazard profiles. Basic sketches / diagrams / maps may be used and can be credited.	**1-3 marks** Applies knowledge and understanding to produce an assessment with limited coherence and support from some evidence. Limited application of knowledge and understanding to discuss the extent to which hazard profiling is a useful tool to compare tectonic activity.
	0 marks Response not creditworthy or not attempted.	**0 marks** Response not creditworthy or not attempted.

Section C: Challenges in the 21st Century

8. Assess the view that the most significant challenges that places face are the result of physical processes.	AO1	AO2.1a	AO2.1b	AO2.1c	AO3.1	AO3.2	**Total**
			10				**10**

Indicative content

Within the answer to question 8, candidates may use **Figures 8a and 8b** together with appropriate knowledge and understanding of the connections between different aspects of this area across the whole specification in order to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Much will depend on how the candidate defines 'significant challenge'. This could take several approaches e.g. economic impact, social impacts etc. or a combination of several factors.

Figure 8a shows the tsunami worldwide risk potential along coastlines. This will provide potential stimulus for discussion on the social, economic and environmental challenges faced by countries at different development levels. Expect discussion around that in many cases, the boundary between continental plates, coasts experience earthquakes and volcanic eruptions more frequently. Most global trade crosses the oceans; ports are the entry and exit points of a nation's trade. As a consequence, coasts attract people, businesses and industries. Some coastal regions rank among the top places in the world in terms of population and value accumulation. There is also high investment on coastlines with regards to defences and mitigation against secondary hazards e.g. Japan.

Figure 8b shows the eruption of Etna in 2021 which caused no injuries and evacuations were not necessary. Large populations living near tectonic hazards may stimulate discussion around disruptions of everyday economic life by: destruction of industrial plant; disruption of transport network; loss of farmland; loss of coastal tourism; loss of trade, etc. Also expect commentary around the higher the level of development, the more resources (especially capital), technology and skills available to make adjustments (mitigate) in anticipation of future 'challenges' as well as to deal with the aftermath of a hazard. In other words, less vulnerability and more resilience reducing overall 'challenge'. Expect candidates to argue that the nature of impacts will vary over space as well as time.

Volcanic primary hazards are more localised; earthquakes can affect much larger areas and thus be a greater challenge to mitigate. The same applies to secondary hazards, especially to tsunamis. Candidates may also argue that short term impacts in LIC's e.g. Haiti could cause the population to become reliant on foreign aid. Time scale could be addressed here with some of the island's population still living in tents 5 years after the earthquake in 2010. This demonstrates the complexity of the challenge to mitigate the impact of physical processes.

Potential synoptic areas (a combination/depth required to enter band 3):

- Timescales – short and long term
- Scale – use of examples local/global
- Social and economic factors considered equally
- Future – Coastal protection investment, tourism, mitigation

Marking guidance

Accept any physical process and do not limit to the photographs given.

Candidates may use the resources but it is not essential, they will look to discuss the possible social and economic impacts at a variety of scales.

Award the marks as follows:		
Band	**Marks**	**AO2.1b (10 marks)**
3	**7-10**	Applies knowledge and understanding from across the specification to produce a thorough and coherent evaluation that is supported by evidence. Well-developed synthesis of geographical ideas, concepts and issues from the resources provided and from across the specification and in different contexts, in order to make well-judged connections. Applies knowledge and understanding from across the specification to suggest how risk may vary across time and space. Uses accurate and well-developed examples from across the specification.
2	**4-6**	Applies knowledge and understanding from across the specification to produce a coherent but partial evaluation that is supported by some evidence. Partial synthesis of geographical ideas, concepts and issues from the resources provided and from across the specification and in different contexts, in order to make partial connections. Applies knowledge and understanding from across the specification to partially suggest how hazard impacts vary between places and uses mostly appropriate and developed examples from across the specification.
1	**1-3**	Applies knowledge and understanding from across the specification to produce an evaluation with limited coherence and support from some evidence. Limited synthesis of geographical ideas, concepts and issues from the resources provided and from across the specification and in different contexts, making limited connections. Limited application of knowledge and understanding from across the specification to suggest how hazards might impact places. The response draws upon a limited number of under developed examples from across the specification.
	0	Response not creditworthy or not attempted.