CONFERENCE VERSION

GCE AS MARKING SCHEME

AUTUMN 2020

AS
GEOGRAPHY - COMPONENT 1
B110U10-1

INTRODUCTION

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

GCE AS GEOGRAPHY

AUTUMN 2020 MARK SCHEME

COMPONENT 1: CHANGING LANDSCAPES

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 suggest inputs into this coastal system. Content: 1.1.1	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
	5						**5**

Indicative content

There are a wide variety of inputs that could be identified but only credit inputs that are evident in the image or inputs identified with reference to the resource. Responses may include:

- marine inputs – waves input energy onto the cliffs and beach, tides and/or currents input sediment onto the beach
- geological inputs – rock type and structure may influence the rate of input sediment, material from marine deposition may form an input onto the beach, weathering of, and mass movement from, the cliffs may provide sediment inputs onto the beach
- energy inputs – kinetic energy from waves and wind, thermal energy from the sun and potential energy from material on cliffs/slopes and material from processes of weathering, mass movement, erosion and deposition
- human inputs – steps at the base of the cliff, removal of protective vegetation on footpaths increases input of sediment from mass movement.

Credit any other valid points.

Award the marks as follows:		
Band	**Marks**	
3	**4-5**	Clear identification and explanation of inputs - two or more could be well developed or several inputs discussed in brief. A confident understanding of this element of the coastal system is shown and applied firmly to the resource.
2	**2-3**	Mostly sound explanation of inputs linked to the resource in full or in part.
1	**1**	Limited coverage of inputs - simple statements with limited application to the resource.
	0	No valid comments.

(b) Examine the role of marine processes in causing variations in beach profiles. Content: 1.1.3 & 1.1.7	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
	7			3			**10**

Indicative content

AO1

AO1 content encompasses knowledge and understanding of variations in the characteristics of beach profiles and processes that responsible including marine mechanisms and other factors. The balance of the content will depend upon the beach profiles selected but may include knowledge and understanding of:

- variations in beach profiles. Answers may refer to the overall gradient of the beach, the width of a beach, small scale variations in the profile such berms and ridge and runnel, seasonal variations in profile or short-term changes in profile in response to storms
- the role of marine processes. Answers may refer to different wave types and their impact on beach profiles – e.g. constructive waves have bigger swash than backwash and thus sediment is accumulated giving a gentle beach profile, destructive waves have larger backwash and remove more material and thus produce steeper profiles. There may be links to seasonal occurrence of different wave types and comment on the removal of sediment in winter storms that narrows a beach and vice versa. Some answers may comment on the production of storm beaches by storm waves that throw large grain sediment to the top of a beach and do not remove it
- other factors that influence beach profiles such as sediment sizes. Shingle beaches typically have a steep gradient (over 10˚) because the waves easily flow through the coarse, porous surface of the beach, decreasing the effect of backwash erosion and causing the formation of a steep profile. Sandy beaches are typically flatter (>5˚) and wider as the smaller particles are evenly distributed and water takes longer to percolate down into the sand so more sand is removed with the backwash. Linked to this is the geology of the cliff which may influence the size of sediment on a beach and thus its profile. Some answers may comment on how human intervention may influence the profile of a beach by dredging offshore and allowing more destructive waves to become more active or beach nourishment may widen a beach.

AO2

Candidates demonstrate application of knowledge and understanding through an examination of the processes and how they cause variations. Responses may include an examination of:

- the relative importance of different marine processes that cause variations e.g. the relative role of different active factors such as waves and tides
- changing roles over different timescales e.g. seasonal variations in wave power may change a beach profile throughout the year
- the relative importance of different factors over space
- the relative importance of active factors such as waves versus passive factors such as beach sediment
- the relative importance of natural and human factors.

Marking guidance

Some responses may use annotated diagrams and these should be given credit where appropriate. Credit other valid points.

Credit any other valid points.

Award the marks as follows:		
	AO1 (7 marks)	**AO2.1c (3 marks)**
Band	*Demonstrates knowledge and understanding of the role of marine processes which cause variations in beach profiles.*	*Applies knowledge and understanding to examine the role of marine processes in causing variations in beach profiles.*
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 the processes responsible. Demonstrates detailed and accurate knowledge and understanding of the link between marine and other processes and variations in beach profiles. 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 assessment of the link between marine processes and variations in beach profiles.
2	**3-4 marks** Demonstrates partial knowledge and understanding through the use of examples. Demonstrates partial knowledge and understanding of the link between marine processes and variations in beach profiles. 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 assessment of the link between marine processes and variations in beach profiles.
1	**1-2 marks** Demonstrates limited knowledge and understanding through a limited number of undeveloped examples. Demonstrates limited knowledge and understanding of the link between marine processes and variations in beach profiles. 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 assessment of the link between marine processes and variations in beach profiles.
	0 marks Response not creditworthy or not attempted.	**0 marks** Response not creditworthy or not attempted.

2. (a) Use **Figure 2** to describe the relationship between wave orientation and wave height. Skills: 3.10	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
					5		**5**

Indicative content

There are many patterns that can be identified but a spatial awareness is needed for Band 3 i.e. an overall sense of pattern and use of compass direction with data. Statements may include:

- Largest % of high waves come from NW
- All high waves from a westerly direction
- Waves of medium height from a sector ranging from N to SSW
- Medium height waves form a high proportion of waves from westerly direction
- Low waves from all directions
- Low waves form the highest proportion of waves in all directions

Credit any other valid points.

Award the marks as follows:		
Band	**Marks**	
3	**4-5**	Clear focus on the relationship between the two variables with overall patterns identified. Wide use of the resource as source of data to support the description.
2	**2-3**	Partial relationship identified with some identification of patterns. Partial use of the resource as source of data to support the description.
1	**1**	Simple statements that may recognise elements of a relationship. No clear patterns identified. Limited use of the resource as a source of data.
	0	No valid comments.

(b) Evaluate the relative importance of sub-aerial weathering processes in the formation of **one or more** high energy coastal landforms. Content: 1.1.4	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
	7			8			**15**

Indicative content
High energy coastal landforms will normally refer to erosional such as headlands, cliffs and shoreline platforms, but some answers may refer to localised depositional landforms such as storm beaches.

AO1
AO1 content encompassess knowledge and understanding of the factors that are important in the formation of one or more high energy coastal landforms. Candidates are directed towards sub-aerial weathering but may consider other factors such as marine processes, geology, mass movement and human activity. Responses may include knowledge and understanding of:

- high energy coasts. High energy coasts are usually characterised by strong wave action, typically during the winter months. The rate of erosion usually exceeds the amount of material that is deposited
- sub-aerial processes and their role in the formation of high energy coastal landforms. Valid weathering processes may include freeze/thaw, exfoliation, forms of chemical weathering such as solution and salt crystal growth and biological weathering. Answers may comment on the role of weathering in the breakdown of rock to form smaller sediment particles which may materials for high energy depositional features. Weathering also weakens rock so that it can eroded by other processes
- other processes that form high energy coastal landforms. These could refer to marine erosional processes or other sub-aerial processes such as mass movement. In places tidal cycles and ranges may provide high energy conditions that influence landforms
- other factors that may influence the formation of high energy coastal landforms. These may refer to geological characteristics of the coast such as lithology and structure or the shape and orientation of a coastline as well as seabed topography
- the influence of human activity such as the protection provided by management systems.

AO2
Candidates should apply knowledge and understanding to evaluate the relative importance of sub-aerial weathering process in the formation of one or more high energy landforms. The content may vary according to the landform but may include an examination of:

- the importance of different sub-aerial weathering processes in relation to each other
- the importance of other marine processes
- the importance of other sub-aerial processes
- the relative importance of other factors
- the interaction of processes and factors in a high energy coastal environment
- the relative importance of processes and factors in different spatial contexts.

Marking guidance

Award a maximum of 4 AO1 marks if the candidate has not successfully identified a high-energy landform (Band 2). Some candidates may address the question via named examples and the use of diagrams and these approaches can gain maximum credit where used effectively.

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

Credit any other valid points.

Award the marks as follows:		
	AO1 (7 marks)	**AO2.1c (8 marks)**
Band	*Demonstrates knowledge and understanding of the role of sub-aerial processes of weathering in the formation of **one or more** high-energy coastal landforms.*	*Applies knowledge and understanding to evaluate the relative importance of sub-aerial processes of weathering in the formation of **one or more** high-energy coastal landforms.*
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 role of sub-aerial processes of weathering in the formation of **one or more** high-energy coastal landforms. 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 evaluation that is supported by evidence. Applies knowledge and understanding to produce a thorough and coherent evaluation of the relative importance of sub-aerial processes of weathering in the formation of **one or more** high-energy coastal landforms. A substantiated conclusion will be evident.
2	**3-5 marks** Demonstrates partial knowledge and understanding through the partial use of appropriate and developed examples. Demonstrates partial knowledge and understanding of the role of sub-aerial processes of weathering in the formation of **one or more** high-energy coastal landforms. Sketches / diagrams / maps may also be used and should be credited.	**3-6 marks** Applies knowledge and understanding to produce a coherent but partial evaluation that is supported by some evidence. Applies knowledge and understanding to produce a coherent but partial evaluation of the relative importance of sub-aerial processes of weathering in the formation of **one or more** high-energy coastal landforms.
1	**1-2 marks** Demonstrates limited knowledge and understanding through a limited number of underdeveloped examples. Demonstrates limited understanding of the role of sub-aerial processes of weathering in the formation of **one or more** high-energy coastal landforms. Sketches /diagrams / maps may be used and can be credited.	**1-2 marks** Applies knowledge and understanding to produce an evaluation with limited coherence and support from some evidence. Applies knowledge and understanding to produce a limited analysis and evaluation of the relative importance of sub-aerial processes of weathering in the formation of **one or more** high-energy coastal landforms.
	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 suggest inputs into this glacial system. Content: 1.2.1	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
					5		**5**

Indicative content:

There are a wide variety of inputs that could be identified but only credit inputs that are evident in the image or inputs identified with reference to the resource. Responses may include:

- ice inputs into the glacial system – the accumulation of ice via inputs of snow/hail and inputs of ice via avalanches from the slopes above the glacier and wind-blown snow
- sediment inputs into the glacial system – debris enters the glacier via weathering of slopes above the glacier and also the erosion of the bed and valley sides by the glacier
- landscape inputs into the glacial system – the gradient of the landscape influences the speed of glacier movement and ice flow
- atmospheric inputs into the glacial system – temperature influences accumulation and ablation and thus the growth and retreat of glaciers
- geological inputs – rock type and structure may influence the rate of sediment input.

Credit any other valid points.

Award the marks as follows:		
Band	**Marks**	
3	**4-5**	Clear identification and explanation of inputs - two or more could be well developed or several inputs discussed in brief. A confident understanding of this element of the glacial system is shown and applied firmly to the resource.
2	**2-3**	Mostly sound explanation of inputs linked to the resource in full or in part.
1	**1**	Limited coverage of inputs - simple statements with limited application to the resource.
	0	No valid comments.

(b) Examine the causes of changes in glacial budgets through historical time. Content: 1.2.2	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
	7			3			**10**

Indicative content

AO1
Candidates should be able to demonstrate knowledge and understanding of the causes of changes in the glacial budget through historical time. Seasonal changes in the glacial budget are mainly the result of temperature changes which cause accumulation in winter and ablation in summer. Causal factors identified may include:

- sunspot activity – variations in the amount of energy emitted by the sun due to sunspot activity. Dark sunspots mean lots of energy is being released by the sun – possible cause of the Medieval Warm Period. In the Maunder Minimum there were few sunspots
- climate change – the burning of fossil fuels has increased the amount of greenhouse gases in the atmosphere which increases global temperature. This increases the rate of ablation of glaciers so that it is more than accumulation and thus causes retreat.
- cooling effect of large volcanic eruptions – eruptions of high explosivity produce huge volumes of ash, sulphur dioxide, carbon dioxide and water vapour which are ejected high into the atmosphere and reduce the amount of solar energy reaching the earth. e.g. the Little Ice Age (AD 1550-1750)
- radiative (solar) forcing is the difference between the amount of sunlight absorbed by the earth and energy radiated back – candidates may use the concepts above to explain positive and negative balances and their impact on glacial budgets.

Other causal factors of short-term fluctuations are also creditworthy.

AO2
Candidates demonstrate application of knowledge and understanding through an examination of the different causes of change in glacial budgets through historical time. The examination could include:

- an evaluation of how different causes impact the budget to give a positive or negative outcome. A comparison of the causes that have given positive and negative budgets e.g. the different causes of the Little Ice Age and The Medieval Warm period
- evaluation of the relative importance of causes over historic time – a view of the role of anthropogenic causes of glacial budget change
- an analysis of the interaction of causes of glacial budget change – radiative forcing approach.

Marking guidance

Where only one cause of change in glacial budgets is identified, a maximum of 4 AO1 marks should be awarded (Band 2). In order to be awarded marks in Band 3 for AO2, candidates must clearly address the temporal element of the question.

Credit any other valid points.

Award the marks as follows:		
	AO1 (7 marks)	**AO2.1c (3 marks)**
Band	*Demonstrates knowledge and understanding of the causes of changes in glacial budgets through historical time.*	*Applies knowledge and understanding to examine the causes of changes in glacial budgets through historical time.*
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 on the causes of changes in glacial budgets through historical time. 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 causes of changes in glacial budgets through historical time.
2	**3-4 marks** Demonstrates partial knowledge and understanding through the partial use of appropriate and well-developed examples Demonstrates partial knowledge and understanding of the causes (or developed knowledge of one cause) of changes in glacial budgets through historical time. 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 causes of changes in glacial budgets through historical time.
1	**1-2 marks** Demonstrates limited knowledge and understanding through a limited number of undeveloped examples. Demonstrates limited knowledge and understanding of the cause of changes in glacial budgets through historical time (one cause may be 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 causes of changes in glacial budgets through historical time.
	0 marks Response not creditworthy or not attempted.	**0 marks** Response not creditworthy or not attempted.

4. (a) Use **Figure 4** to describe the relationship between number and area of glaciers. Skills: 3.10	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
					5		**5**

Indicative content

The question focuses on the relationship between number and area as shown by the resources. Responses may include:

- North-facing glaciers are generally higher in number and have the greatest total area
- South-facing glaciers are generally lower in number and cover a smaller total area
- There are relatively few east or south-east-facing glaciers but these cover a relatively large total area
- Although there are a greater number of north-east-facing than east-facing glaciers, the east-facing glaciers cover a larger total area
- Credit quantification when used to support patterns/relationships identified.

Credit other relationships that can be identified but an overall sense of pattern is needed in order to reach Band 3.

Award the marks as follows:		
Band	**Marks**	
3	**4-5**	Clear description of the relationship shown. Wide use of the resource to support the description. Reference made to the overall relationship evident.
2	**2-3**	Some identification of the relationships evident. Partial use of the resource as source of data to support the description.
1	**1**	Simple statements made. Limited use of the resource as a source of data.
	0	No valid comments.

(b) Evaluate the relative importance of periglacial processes in the formation of **one or more** glacial landforms. Content: 1.2.7	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
	7			8			**15**

Indicative content

AO1
Candidates should be able to show the knowledge and understanding of the role of periglacial processes in the formation of selected glacial landform(s). Responses may include knowledge and understanding of:

- Ground ice formation leads to associated features including ice lenses, ice wedge polygons, patterned ground, pingos and thermokarst landscapes
- Frost weathering and mass movement produces nivation hollows, blockfields, scree slopes and protalus ramparts, but higher temperatures in summer may lead to solifluction, an important but slow movement process contributing to solifluction terraces and head deposits
- Periglacial action by water results in dry valleys, and periglacial action by wind results in the formation of loess plateaux
- Glacial erosion processes may strip protective regolith and expose bedrock which can then be frost weathered to form blockfields
- Glacial deposition processes may accumulate sediment in which ground ice can operate
- Knowledge and understanding of human impacts – some answers may argue that climate change may cause changes in the distribution and extent of periglacial processes and landscapes. Some may refer to mineral exploration and exploitation in periglacial environments that destroy landscape features.

AO2
Candidates demonstrate application of knowledge and understanding to evaluate the importance of periglacial processes in the formation of the chosen landform/s. Approaches could include an evaluation of:

- the relative importance of different periglacial processes in the formation of the chosen landform or group of landforms
- the relative importance of periglacial processes in relation to other processes which may play a part in the formation of the chosen landform/s
- how the importance of periglacial and other processes can vary over time and space and/or between differing landscapes.

Marking guidance

Credit use of diagrams where it supports or enhances the description or evaluation.

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

Credit any other valid points.

Award the marks as follows:		
	AO1 (7 marks)	**AO2.1c (8 marks)**
Band	Demonstrates knowledge and understanding of the importance of periglacial processes in the formation of **one or more** glacial landforms	Applies knowledge and understanding to evaluate the importance of periglacial processes in the formation of **one or more** glacial landforms.
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 importance of periglacial processes in the formation of **one or more** glacial landforms. 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 evaluation that is supported by evidence. Applies knowledge and understanding to produce a thorough and coherent evaluation of the importance of periglacial processes in the formation of **one or more** glacial landforms. A clear conclusion will be evident.
2	**3-5 marks** Demonstrates partial knowledge and understanding through the use of appropriate and partially developed examples. Demonstrates partial knowledge and understanding of the importance of periglacial processes in the formation of **one or more** glacial landforms. Sketches / diagrams / maps may also be used and should be credited.	**3-6 marks** Applies knowledge and understanding to produce a coherent but partial evaluation that is supported by some evidence. Applies knowledge and understanding to produce a coherent but partial evaluation n of the importance of periglacial processes in the formation of **one or more** glacial landforms.
1	**1-2 marks** Demonstrates limited knowledge and understanding through a limited number of underdeveloped examples. Demonstrates limited understanding of the of the importance of periglacial processes in the formation of **one or more** glacial landforms. Sketches /diagrams / maps may be used and can be credited.	**1-2 marks** Applies knowledge and understanding to produce an evaluation with limited coherence and support from some evidence. Applies knowledge and understanding to produce a limited evaluation of the importance of periglacial processes in the formation of **one or more** glacial landforms.
	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 identify impacts of the tsunami. Skills: 7.1	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
					5		**5**

Indicative Content:

There are a range of impacts which can be identified. Responses may include:

- Loss of land – a range of areas could be identified
- Loss of tress/vegetation
- Discolouration of the water/increase in silt
- Homes destroyed – a range of areas could be identified
- Bridge destroyed (2B)
- Infrastructure (roads) / industrial areas destroyed – a range of areas could be identified.

Candidates **may** use the grid feature to enable them to identify specific impacts effectively.

Marking guidance

There are a wide variety of impacts that can be credited, but they must be directly identifiable within the photographs. Do not credit implied impacts. Credit any other valid points.

Award the marks as follows:		
Band	**Marks**	
3	**4-5**	Detailed understanding of more than one evident impact that links directly to the photographs. Effective use of the photographs to support descriptions.
2	**2-3**	Partial understanding of the impacts evident with only partial use of the photographs.
1	**1**	Limited statements concerning identifiable impacts made.
	0	No valid comments.

5. (b) Use **Figure 6** to analyse the pattern of inundation. Skills: 1.4, 1.5, 7.1	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
					6		**6**

Indicative Content

The question requires a detailed analysis of Figure 6 to identify patterns of inundation. Responses may include:

- highest inundations at the head of the bay
- eastern side has higher inundation distances
- considerable inundation to the south-east end of Palu Bay with the largest distances being at Site 6 (512 m)
- lowest amounts are near the entrance of the bay on the western side with inundation ranging from 36m at Site 1 to 104 meters at Site 3
- A larger range of inundation distances is seen on the eastern side of Palu Bay (104m at Site 7 to 512 m at Site 6).

Marking guidance

Credit correct use of scale and compass points. An overall sense of pattern is needed in order to reach Band 3. Credit other valid points.

Award the marks as follows:		
Band	**Marks**	
3	**5-6**	Detailed analysis of the pattern shown with good use of supporting data. Clear use of compass point and or scale may be evident. Includes reference(s) to the overall pattern evident.
2	**3-4**	Partial understanding of the pattern shown. May make a series of isolated points with some data support.
1	**1-2**	Limited statements made in relation to the pattern shown by the resource.
	0	No valid comments.

(c) (i) Use **Figure 7** to estimate the magnitude of the earthquake that had the highest death toll. Give your answer to 1 decimal place. Skills: 2.11	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
					1		**1**

Indicative content

Accept 9.1 or 9.2 **only** as correct answers.

(ii) Suggest **one** reason for the use of a logarithmic scale to display these data. Skills: 3.6	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
Allow 1 mark for any of the following points to a maximum of 2 marks.					2		**2**

Indicative content

A logarithmic scale is a nonlinear scale used when there is a large range/distribution of data (1) enables a range of data to be accommodated in a manageable graph (1). In this context, it allows data from 1 to 1 000 000 on the y axis (1). This data could not be easily presented using an arithmetic scale where all points are equally spaced (1).

Credit other valid points.

(iii) Explain why a scatter plot is an appropriate technique for displaying these data. Skills: 2.11	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
Allow 1 mark for any of the following points to a maximum of 3 marks.					3		**3**

Indicative content

This diagram is used to find the correlation between these two variables (1) and how they are related. There is an expectation that these two variables would be related (1). Can help show a positive, negative or a lack of correlation (1). After determining the correlation, it is possible to predict the behaviour of the dependent variable based on the measure of the independent variable (1).

Credit other valid points.

(iv) State and justify one alternative graphical technique that could be used to present the data for earthquake magnitude shown in **Figure 7**. Skills: 3.6	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
					3		**3**

Indicative content

Credit one of the following techniques with a further two marks awarded for correct justification of the selected technique.

Techniques:
- Bar graph (1)
- Located bar graph (1)

Justification:
Bar charts are used to show discrete data in several categories (1) and will assist in identifying a pattern e.g. the most commonly occurring earthquakes in terms of magnitude (1)
In addition to the points above, located bar graphs could help identify a spatial pattern (1)

Credit other valid points but do not credit a method more suitable for continuous data e.g. line graphs.

(d) Outline the processes that operate at **one** of the following converging plate margin types: (i) oceanic / oceanic (ii) oceanic / continental (iii) continental / continental Content: 1.3.1	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
	8						**8**

Indicative content:

AO1
Candidates should show knowledge and understanding of a range of processes occurring at their chosen margin type. There may be reference to the common mechanisms that drive the tectonic plates as introduction to each boundary so accept reference to:

- mantle convection currents— warm mantle currents drive and carry plates of lithosphere along a like a conveyor belt
- ridge push (buoyant upwelling mantle at mid-ocean ridges) — newly-formed plates at oceanic ridges are warm, and so have a higher elevation at the oceanic ridge than the colder, more dense plate material further away; gravity causes the higher plate at the ridge to push away the lithosphere that lies further from the ridge
- slab pull — older, colder plates sink at subduction zones, because as they cool, they become more dense than the underlying mantle. The cooler sinking plate pulls the rest of the warmer plate along behind it.

Oceanic / Oceanic

- If the two plates that meet at a convergent plate boundary are both composed of oceanic crust, the older, denser plate will subduct beneath the less dense plate as it is often colder
- Subducted plate descends at a relatively shallow angle close to the subduction zone but at a steeper angle further down (about 45 degrees).
- Subduction forms an ocean trench e.g. Marianas trench
- Large volumes of water within the subducted material is released as it is heated – this mixes with overlying mantle and lowers the melting point thus producing magma.
- Magma is lighter than surrounding mantle and rises through the mantle and overlying crust to the ocean floor where it produces a chain of islands called an island arc e.g. Aleutian Islands
- Relatively deep earthquakes occur as subducting plate moves against overriding plate.

Continental / Oceanic

- When continental and oceanic plates collide, the thinner and more dense oceanic plate is overridden by the thicker and less dense continental plate. The oceanic plate is forced down into the mantle in a process known as subduction This forms an ocean trench, often running parallel to the coastline
- As the oceanic plate descends, it is forced into higher temperature environments. At a depth of about 100 miles (160 km), materials in the subducting plate begin to approach their melting temperatures and a process of partial melting begins. This partial melting produces magma chambers above the subducting oceanic plate.
- Magma is less dense than the surrounding mantle materials and is buoyant. The buoyant magma begins a slow ascent through the overlying materials, melting and fracturing their way upwards.
- Much of the rising magma does not reach the surface as the continental crust is low density – it solidifies below the surface as a pluton. This thickens the continental crust, and the crust rises due to isostacy to form mountains.
- Where the two plates collide, the continental crust is deformed and sediment that has accumulated on the ocean floor between the plates is folded to form fold mountains e.g. the Andes
- If a magma chamber rises to the surface without solidifying, the magma will break through in the form of a volcanic eruption. The eruption is explosive due to the character of the magma.

Continental / Continental

- Continent to continent collision occurs where a continent or large island collides with another continent
- Colliding continents will not subduct as the material is too light/buoyant – they are composed of light continental rocks
- Where the two continents meet the crust is crumpled, deformed and folded
- Sediment that has accumulated on an ocean floor between the continents is deformed and folded to form fold mountains e.g. Himalayas
- Earthquakes occur along faults caused by deformation and folding.

Credit any other valid points and use of diagrams where they assist or enhance the description provided.

Award the marks as follows:		
Band	**Marks**	
3	**7-8**	Detailed and accurate knowledge and understanding of the processes that operate at the selected margin.
2	**4-6**	Mostly accurate but partial knowledge and understanding shown in relation to the processes operating at the selected margin. May lack detail on process and be descriptive in nature at the lower end.
1	**1-3**	Limited statements made with limited understanding of the processes operating at the selected margin.
0	**0**	No creditworthy points made.

(e) 'Quality of governance significantly affects peoples' risk and vulnerability from tectonic events.' Discuss. Content: 1.3.7	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
	5			7			**12**

Indicative content

AO1
Candidates should show knowledge and understanding of how the quality of governance affects levels of risk and vulnerability to tectonic hazards. Approaches may include knowledge and understanding of:

- how good governance may significantly reduce the risk or vulnerability of a population through investment in infrastructure, effective emergency services and/or education and healthcare. Good governance may ensure equality of access to services to ensure that some groups within the population are not left more vulnerable than others
- how good governance may be reflected in adequate investment in early and/or effective warning systems that mitigate risk and vulnerability to tectonic hazards
- good governance may mean that a variety of stakeholders both public and private are engaged in a co-ordinated strategy to modify risk and vulnerability to tectonic events
- how poor governance in the form of corruption or weak political organisation can increase vulnerability in a number of ways e.g. failure to invest in infrastructure that may mitigate the effects of tectonic events or being ill prepared to deal with a hazard event
- Useful examples identified could include the Haiti earthquake (2010), Indian Ocean tsunami (2004).

AO2
Candidates demonstrate application of knowledge and understanding through a discussion of the extent to which quality of governance significantly impacts risk and vulnerability from tectonic events. Discussions could include and evaluation of:

- how quality of governance varies over space and time in order to leave some areas or groups more vulnerable or 'at risk' than others
- how levels of economic development may enhance or impede the ability to modify risk and vulnerability and may affect ability to invest in short-term and long-term response strategies
- other factors which are important in determining levels of risk e.g. physical factors, including the magnitude of the event; social factors including population density, population profile (age, gender) and levels of education; geographical factors including rural / urban location, time of day and degree of isolation.

Marking guidance

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

Credit any other valid points.

Award the marks as follows:		
	AO1 (5 marks)	**AO2.1c (7 marks)**
Band	*Demonstrates knowledge and understanding of how the quality of governance significantly affects peoples' risk and vulnerability from tectonic events.*	*Applies knowledge and understanding to discuss the extent to which the quality of governance affects peoples' risk and vulnerability from tectonic events.*
3	**4-5 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 how the quality of governance significantly affects peoples' risk and vulnerability from tectonic events. 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 discussion that is supported by evidence. Applies knowledge and understanding to produce a thorough and coherent discussion of how quality of governance can modify risk and vulnerability from tectonic events. A clear conclusion will be evident.
2	**2-3 marks** Demonstrates partial knowledge and understanding through the partial use of appropriate and developed examples. Demonstrates partial knowledge and understanding of how the quality of governance significantly affects peoples' risk and vulnerability from tectonic events. Sketches / diagrams / maps may also be used and should be credited.	**3-5 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 of how quality of governance can modify risk and vulnerability from tectonic events.
1	**1 mark** Demonstrates limited knowledge and understanding through a limited number of underdeveloped examples. Demonstrates limited understanding of how the quality of governance significantly affects peoples' risk and vulnerability from tectonic events. 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 discussion of how quality of governance can modify risk and vulnerability from tectonic events.
	0 marks Response not creditworthy or not attempted	**0 marks** Response not creditworthy or not attempted

6. (a) Examine the economic and social impacts of **two** tsunami events. Content: 1.3.6	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
	10			5			**15**

Indicative content

AO1
Candidates should show knowledge and understanding of the economic and social impacts of tsunami events. The content of answers will vary considerably with the selection of the examples used to illustrate the response. Responses may include knowledge and understanding of:

Economic impacts:
- impacts on infrastructure including impacts on housing and facilities e.g. electricity/gas/generating units and transmission networks/water/sewerage. There will be direct costs involved in the repair and replacement costs of these facilities dependent on the severity of damage and the percentage of facilities damaged
- impacts on transportation networks such as railroads, highways, airports, ports and bridges. Tsunamis frequently have a catastrophic impact on coastal transportation networks and facilities located within flood zones. Such loss of facilities may hamper movement of goods, passengers, relief work and reestablishment of normal economic activity
- impacts on businesses. Immediately following a tsunami disaster, many businesses will be unable to trade because of destruction to premises, stock, machinery, facilities, supplies and loss of staff. These will have secondary impacts on standards of living. Businesses impacted by a tsunami will take time to recover their activity to pre-disaster levels
- impacts for the insurance industry when claims are made.

Social impacts:
- impacts due to loss of housing or employment
- impacts due to illness or disease in the wake of a tsunami
- wider psychological impacts resulting from injury or death
- impacts on community coherence (may be a positive impact).

AO2
Candidates demonstrate application of knowledge and understanding to examine the economic and social impacts of two tsunami events. Approaches may include an evaluation of:
- the economic and social impacts of both events in relation to each other
- the economic impacts relative to the social impacts of both identified events
- how other impacts may be more significant e.g. scale of the environmental impacts of the event
- how impacts can vary over time and space due to other factors such as levels of economic development, levels of preparedness etc.

Credit any other valid points.

Award the marks as follows:		
	AO1 (10 marks)	**AO2.1c (5 marks)**
Band	*Demonstrates knowledge and understanding to examine the economic and social impacts of **two** tsunami events.*	*Applies knowledge and understanding to examine the economic and social impacts of **two** tsunami 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 the economic and social impacts of **two** tsunami events. 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 examination that is supported by evidence. Applies knowledge and understanding to produce a thorough and coherent examination of the economic and social impacts of **two** tsunami events.
2	**4-7 marks** Demonstrates partial knowledge and understanding through the partial use of appropriate and developed examples. Demonstrates partial knowledge and understanding of the economic and social impacts of **two** tsunami events. Sketches / diagrams / maps may also be used and should be credited.	**2-3 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 economic and social impacts of **two** tsunami events.
1	**1-3 marks** Demonstrates limited knowledge and understanding through a limited number of underdeveloped examples. Demonstrates limited understanding of the economic and social impacts of **two** tsunami events. 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 economic and social impacts of **two** tsunami events.
	0 marks Response not creditworthy or not attempted	**0 marks** Response not creditworthy or not attempted

(b) 'Urban populations are more at risk from tectonic hazards than rural populations.' Discuss. Content: 1.3.4, 1.3.6 & 1.3.7	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
	10			10			**20**

Indicative content

AO1
Candidates should show knowledge and understanding of the varying impacts of tectonic hazards in rural and urban areas. Candidates may choose to address a variety of different tectonic events within their response and the content will vary widely in relation to the examples chosen. Approaches could include knowledge and understanding of:

- environmental/demographic/economic and social impacts of tectonic activity on people and the built environment in both urban and rural areas
- the characteristics of urban populations that make them at risk from tectonic hazards – population density, age structure, housing quality, employment, urban economic structure etc.
- the characteristics of rural populations that make them at risk from tectonic hazards – population density, accessibility, rural economic structure etc.

AO2
Candidates should develop a discussion of the degree to which urban populations are more at risk in comparison to rural populations. Approaches may include an evaluation of:

- how earthquakes can be a more devastating phenomenon when they hit densely populated areas where large number of buildings and infrastructure can be destroyed. The economic losses are greater due to large rebuilding costs and loss of business revenue
- how densely populated areas are more vulnerable to disease where health care and sanitation services may become overwhelmed
- how isolation and poor accessibility of some rural areas can slow rescue and relief and lack of infrastructure and facilities can make the population more vulnerable to unemployment through the devastation of the agricultural sector and transport links
- how urban areas usually have more facilities and better infrastructure (hospitals, food stores and transport systems) than rural areas, which increases resilience
- how impacts may be similar for both areas (depending on the example chosen) e.g. loss of tourism revenue
- how other factors may modify the levels of risk and vulnerability in both areas over space and time.

Marking guidance

For marks in Band 3 for AO2 candidates should address the discussion in terms of both rural and urban areas.

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

Credit any other valid points.

Award the marks as follows:		
	AO1 (10 marks)	**AO2.1c (10 marks)**
Band	*Demonstrates knowledge and understanding of the risks created by tectonic hazards in urban and rural areas.*	*Applies knowledge and understanding to discuss varying levels of risk created by tectonic hazards in urban and rural areas.*
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 the varying impacts of tectonic hazards in rural and urban areas. 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 discussion that is supported by evidence. Applies knowledge and understanding to produce a thorough and coherent discussion of the varying levels of risk created by tectonic hazards in urban and rural areas. Balanced discussion of risks in urban and rural areas. A clear conclusion will be evident.
2	**4-6 marks** Demonstrates partial knowledge and understanding through the partial use of appropriate and developed examples. Demonstrates partial knowledge and understanding of some understanding of the varying impacts of tectonic hazards in rural and urban areas. Sketches / diagrams / maps may also be used and should be credited.	**4-6 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 partial discussion of the varying levels of risk created by tectonic hazards in urban and rural areas.
1	**1-3 marks** Demonstrates limited knowledge and understanding through a limited number of undeveloped examples. Demonstrates limited understanding of the varying impacts of tectonic hazards in rural and urban areas. Basic sketches / diagrams / maps may be used and can be credited.	**1-3 marks** Applies knowledge and understanding to produce a discussion with limited coherence and support from some evidence. Limited application of knowledge and understanding to discuss the varying levels of risk created by tectonic hazards in urban and rural areas.
	0 marks Response not creditworthy or not attempted.	**0 marks** Response not creditworthy or not attempted.

Section C: Challenges in the 21st Century

7. To what extent is place meaning altered by physical processes?	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
				10			**10**

Indicative content

Within the answer to question 7, 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.

'Place meaning' can refer to the way in which individuals view a place and are thus personal and reflect a perception of place – e.g. they can be viewed as dangerous, beautiful, prestigious, convenient, prosperous etc. Places are also meaningful at a societal level as they provide groups of people with a shared understanding or perception of place e.g. not all members of a community will identify a place as dangerous or beautiful or advantageous to live in. Meanings that are associated with place are dynamic and can change over time slowly or rapidly, both overall and within a community.

Candidates should show how physical process can alter a place and should make clear links to place meaning. The question of physical processes can be addressed via content studied throughout the qualification and relevant links can be made to geophysical processes within studies of:

- Tectonic Hazards e.g. place meaning altered for different groups following a tectonic event (this may be a positive or a negative change
- Coastal Landscapes and/or Glaciated Landscapes e.g. places become tourism 'hotspots' or may develop different meanings after they are adapted by physical processes e.g. winter storms or avalanches.

Candidates may make reference to any of the following concepts to illustrate the dynamic nature of places and the fact that places can be made at a variety of scales:

- Timescales – short term/long term changes or possible future change within certain landscapes that may adapt their meaning
- Spatial scales – local/regional/global.

Marking guidance

Candidates should gain credit for drawing on examples from across the specification.

Award the marks as follows:		
Band	**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 across the specification and in different contexts, in order to make well-judged connections. Applies knowledge and understanding from across the specification to judge the extent to which place meaning is affected by physical processes.
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 across the specification and in different contexts, in order to make partial connections. Applies knowledge and understanding from across the specification to partially judge the extent to which place meaning is affected by physical processes.
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 across the specification and in different contexts, making limited connections. Limited application of knowledge and understanding from across the specification to make limited judgements on the extent which place meaning is affected by physical processes.
	0	Response not creditworthy or not attempted.