GCE AS MARKING SCHEME

SUMMER 2022

AS
GEOGRAPHY – UNIT 1
2110U10-1

INTRODUCTION

This marking scheme was used by WJEC for the 2022 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 GEOGRAPHY

SUMMER 2022 MARK SCHEME

UNIT 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 unit 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. Do not use crosses to indicate answers that are incorrect. 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.

The second part is 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 unit. The targeted AO(s) are also indicated, for example AO2.1c.

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 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.

Banded mark schemes Stage 1 – Deciding on the band

When deciding on a band, the answer should be viewed holistically. 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), detailed advice from the Principal Examiner on the qualities of each mark band will be given. 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 also provided for banded mark schemes. 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 specialised concepts from the specification that apply in the indicative content are underlined.

The mark scheme reflects the layout of the examination paper.

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: Changing Landscapes

Either: Coastal Landscapes

1. (a) (i) Use **Figures 1a and 1b** to compare the characteristics of the two beaches. Skills: 8.2	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
Award 1 mark for each comparative point + 1 for supporting data or development.					5		**5**

Indicative content

- Pendine wider than Esgair Gemlyn (1) – 400m:30m/370m wider (1)
- They consist of different sediment (1) – Pendine is sand whilst Esgair Gemlyn is pebbles (1) OR Pendine is smaller size sediment (1)
- Esgair Gemlyn steeper than Pendine (1)
- Esgair Gemlyn has berms whereas Pendine has a smooth profile (1) There are 4/5 berms (1) OR Pendine has a smoother profile (1)
- Pendine is a straight beach, Esgair Gemlyn is curved / bayhead beach (1)

Credit other valid responses.

1. (a) (ii) Suggest **one** reason why the beach in **Figure 1a** is backed by sand dunes. Content: 1.1.7	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
Award 1 mark for identification of valid reason and 2 marks for development related to the formation of dunes.			3				**3**

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. Expect to see a clear reason given with two development points made.

This may include:

- Reason: Pendine has foreshore of unconsolidated sand (wide sandy beach) (1) sand is picked up by wind (1) and blown onshore (1) and transported to build up the dunes (1) a plentiful supply of sand creates / maintains the dunes (1)
- Reason: sand can be eroded / picked up by wind (1) this happens when sand is dry / at low tide (1) it is easily transported to form dunes (1) it is blown onshore (1)
- Reason: vegetation present (1) vegetation traps the sand blown onshore / from the beach (1) marram grass or other e.g. (1) roots stabilize the dunes / embryo dunes
- Reason: onshore prevailing winds (1) likely to use points already mentioned above for full credit.

Credit other valid points not contained in the indicative content.

1. (b) Assess the importance of constructive waves in the development of beach profiles. Content: 1.1.8	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
	5			3			8

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks.

AO1
AO1 content encompasses knowledge and understanding of the seasonal changes of wave type and associated changes to beach characteristics. The content may include knowledge and understanding of:

- the characteristics of constructive waves – flat, low in height, long wavelength, low frequency of between 6 and 9 waves per minute, swash is unimpeded by previous backwash
- how constructive waves influence beach profiles – A strong swash that pushes sediment up the beach, but a weaker backwash is unable to transport all particles back down, so they are deposited as a ridge of sediment (**berm**) at the top of the beach. Backwash percolates into the beach material, friction slows down the wave and releases energy carrying material up the beach but not having enough energy to carry it back down, steepens beach.
- other factors in the development of beach profiles (credit only if constructive waves are also mentioned in the answer) – temporal variation (seasonal/monthly/daily), geology/sediment size, coastal orientation, tidal range, longshore drift etc.

AO2
AO2 content encompasses the application of knowledge and understanding to discuss the importance of seasonal changes associated with beach characteristics. The content may vary but may include assessment of:

- the importance of constructive waves or, conversely, the importance of destructive waves which can develop beach profiles over shorter timescales
- the importance of other factors that develop beach profiles
- the importance of spatial factors – orientation/geology etc.
- the importance of isolated storm events
- spatial differences in the importance of wave type.

Credit other valid points not contained in the indicative content.

Award the marks as follows:		
	AO1 (5 marks)	**AO2.1c (3 marks)**
Band	*Demonstrates knowledge and understanding of the importance of constructive waves in the development of beach profiles.*	*Applies knowledge and understanding to assess the importance of constructive waves in the development of beach profiles.*
3	**4-5 marks** Demonstrates accurate knowledge and understanding of constructive waves and beach profiles. Well-developed knowledge and understanding of the link between constructive waves and the development of beach profiles. Demonstrates accurate knowledge and understanding using appropriate and well-developed examples. Well annotated sketches / diagrams / maps may also be used and should be credited.	**3 marks** Applies knowledge and understanding to construct a well-developed and structured assessment of the importance of constructive waves in the development of beach profiles. Applies knowledge and understanding to construct well-developed and balanced arguments, supported by appropriate evidence.
2	**2-3 marks** Demonstrates partial knowledge and understanding of constructive waves and beach profiles. Demonstrates partial knowledge and understanding of the link between constructive waves and the development of beach profiles. Demonstrates mostly accurate knowledge and understanding through the use of mostly appropriate examples which may not be fully developed. Generalised sketches / diagrams / maps may also be used and should be credited.	**2 marks** Applies partial knowledge and understanding to construct a partial assessment of the importance of constructive waves in the development of beach profiles. Applies knowledge and understanding to construct partially developed and partially balanced arguments, supported by mostly appropriate evidence.
1	**1 mark** Demonstrates limited knowledge and understanding of constructive waves and beach profiles. Demonstrates limited knowledge and understanding of the link between constructive waves and the development of beach profiles. Demonstrates limited knowledge and understanding through the use of examples which are undeveloped. Basic sketches / diagrams / maps may also be used and should be credited.	**1 mark** Applies limited knowledge and understanding to construct a limited assessment of the importance of constructive waves in the development of beach profiles. Applies limited knowledge and understanding to construct limited arguments, supported by limited evidence.
	0 marks Response not creditworthy or not attempted.	**0 marks** Response not creditworthy or not attempted.

2. (a) (i) Use **Figure 2** to describe the pattern of vertical crustal movement relative to sea level. Skills: 3.1	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
Award 1 mark for each valid point + 1 for development using data from map					5		**5**

Indicative content

- Overall pattern shows land rising faster than sea level (1)
- Highest rate of land rising faster than sea level around Gulf of Bothnia or other description of location. (1) Rising at more than 9mm per year relative to sea level. (1)
- Decrease in rate of land rising faster with distance from Gulf of Bothnia in all directions / concentric pattern (1)
- Sea rising faster than land in southern part of map/southern Denmark, northern Germany and Poland. (1) Sea level rises up to 3mm per year relative to the land (1).

Credit other valid points not contained in the indicative content. Maximum 2 marks for list of isolated statements that do not address pattern.

2. (a) (ii) Suggest **one** reason for the variations seen in **Figure 2**. Content: 1.1.8	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
Award 1 mark for identification of valid reason and 2 marks for development related to the variations seen.			3				**3**

Indicative content

- Reason: Depth of glacial ice (1) greater depth of ice exerted more weight / depressed the crust more (1) on melting gives more uplift (1) Ice was thicker in the Gulf of Bothnia (1)
- Reason: Eustatic and / or isostatic change (1) in places land and sea rise at same rate (1) where land is rising sea level change has less impact (1) see other points above
- Reason: Geology (1) some rocks may uplift at a faster rate (1) following melting of ice / isostatically (1)
- Tectonic uplift can be credited as a suggestion – process needs to be linked to variation for development points to be credited.

Credit other valid points not contained in the indicative content.

2. (b) Examine the role of **one** mass movement process in the development of **one or more** coastal landforms Content: 1.1.5	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
	5			3			

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks.

AO1
AO1 content encompasses knowledge and understanding of how one mass movement, and other valid processes contribute to the development of coastal landforms. The content will depend upon the mass movement process and landform(s) chosen and may include knowledge and understanding of:

- Mass movement processes in coastal locations – mudflows, landslides, rockfall
- The link between mass movement processes and the development of coastal landforms. For example answers may relate rockfall to the scars left on cliffs and the accumulation of debris at the cliff base
- Other processes that may contribute to the development of coastal landforms in addition to mass movement – weathering, erosional and depositional processes will probably be the main ones considered but some candidates may discuss the stabilizing role of vegetation.

AO2
AO2 content encompasses the application of knowledge and understanding to examine the role of erosional processes in the formation of landform(s). The content may vary according to the landscape but may include an examination of:

- the contribution of named mass movement
- the contribution of other mass movement processes to the named landform[s]
- the contribution of other geomorphic processes
- the contribution of other factors – geology and human activity
- the contribution of mass movement processes in different locations
- the changing contribution of mass movement over time.

Credit other valid points not contained in the indicative content.

Award the marks as follows:		
	AO1 (5 marks)	**AO2.1c (3 marks)**
Band	*Demonstrates knowledge and understanding of the role of mass movement, and other, processes on selected coastal landform(s).*	*Applies knowledge and understanding to appraise through examining the importance of mass movement processes on selected coastal landform(s).*
3	**4-5 marks** Demonstrates accurate knowledge and understanding of mass movement, and/or other valid, processes. Well-developed knowledge and understanding of link between mass movement, other processes and factors, and the development of coastal landform(s). Demonstrates accurate knowledge and understanding using appropriate and well-developed examples. Well annotated sketches / diagrams / maps may also be used and should be credited.	**3 marks** Applies knowledge and understanding to construct a well-developed and structured examination of the contribution of mass movement. Applies knowledge and understanding to construct well-developed and balanced arguments, supported by appropriate evidence.
2	**2-3 marks** Demonstrates partial knowledge and understanding of mass movement, and/or other valid, processes. Demonstrates partial knowledge and understanding of link between mass movement, other processes and factors, and the development of coastal landform(s). Demonstrates mostly accurate knowledge and understanding through the use of mostly appropriate examples which may not be fully developed. Generalised sketches / diagrams / maps may also be used and should be credited.	**2 marks** Applies partial knowledge and understanding to construct a partial examination of the contribution of mass movement. Applies knowledge and understanding to construct partially developed and partially balanced arguments, supported by mostly appropriate evidence.
1	**1 mark** Demonstrates limited knowledge and understanding of mass movement, and/or other valid, processes. Demonstrates limited knowledge and understanding of link between erosional processes and the formation of selected erosional landform(s). Demonstrates limited knowledge and understanding through the use of examples which are undeveloped. Basic sketches / diagrams / maps may also be used and should be credited.	**1 mark** Applies limited knowledge and understanding to construct a limited examination of the contribution of mass movement. Applies limited knowledge and understanding to construct limited arguments, supported by limited evidence.
	0 marks Response not creditworthy or not attempted.	**0 marks** Response not creditworthy or not attempted.

Or: Glaciated Landscapes

3. (a) (i) Use **Figures 3a and 3b** to compare the characteristics of the two cirques. Skills: 8.2	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
Award 1 mark for each comparative point + 1 for supporting data or development.					5		**5**

Indicative content

- Cwm Cau is larger (1)
- Cwm Cau has a steeper backwall/ higher backwall (1) 80m higher (1)
- Cwm Cau has a lake, Craig Rhiw-erch has not (1) Cwm Cau has a rock lip whereas Craig Rhiw-erch does not (1)
- Cwm Cau has flatter floor (1)
- Cwm Cau has more developed scree slopes (1) OR both have scree slopes (1)
- Cwm Cau has more exposed rock/ more rugged. (1)
- Craig Rhiw-erch is more vegetated (1)

Accept the reverse approach in each instance e.g. Craig Rhiw-Erch is smaller. Do not credit human elements that are not visible in the resource.

3. (a) (ii) Suggest **one** reason for the difference in the characteristics of the backwall of the two cirques. Content: 1.2.5	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
Award 1 mark for identification of valid reason and 2 marks for development related to the backwall characteristics.			3				**3**

Indicative content

Credit comments such as:

- Reason: Cwm Cau steeper because glacier bigger (1) the glacier had more erosive power / weight (1) abrasion and plucking was more rapid (1)
- Reason: Cwm Cau has more exposed rock as vegetation not established on steep slopes (1) vegetation speeds up post glacial weathering (1) smoothing and lowering the surface of Cwm Rhiw-erch (1) temperatures may be cooler in Cwm Cau (1) Cwm Cau could have a more Northerly aspect / be more in the shade (1) which stops vegetation growing (1)
- Reason: Cwm Cau more talus at base of backwall as more weathering (1) more freeze thaw weathering due to cooler microclimate / temperature (1) less vegetation to stabilise rocks (1)
- Reason: Cwm Cau steeper because geology is more resilient (1) can maintain steep slope (1) more resistant to weathering and erosion (1).

Credit other valid points not contained in the indicative content.

3. (b) Assess the importance of ice thickness as a factor affecting the rate of glacial erosion. Content: 1.2.5	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
	5			3			**8**

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks.

AO1
AO1 content encompasses knowledge and understanding of the role of ice thickness (and other factors) as a control of glacial erosion. The content may include:

- Ice thickness; thicker ice exerts more pressure on the valley floor and sides causing more rapid erosion by abrasion and plucking. Thicker ice also causes pressure melting at the base in warm based glaciers, allowing velocity to increase
- Thermal regime; warm based glaciers move downslope much more rapidly, causing abrasion and plucking. Cold based glaciers move through internal deformation and therefore these erosional processes are largely absent
- Ice velocity; faster moving glaciers will cause more abrasion as more material is moved within the ice more quickly. Higher velocity likely to be due to meltwater at base, which will refreeze periodically and cause plucking
- Bedrock permeability; where meltwater is able to percolate into the rocks it is not available to lubricate the glacier movement. Impermeable rocks means that subglacial streams and meltwater increase glacier velocity and rates of erosion, including fluvio-glacial erosion
- Jointing of bedrock (well jointed rocks are more vulnerable to the process of plucking). The jagged rocks within the glacier are then used for abrasion.

AO2
AO2 content encompasses the application of knowledge and understanding to examine the role of ice thickness as a control of glacial erosion. The content may vary but may include an assessment of:

- the relative importance of ice thickness
- the relative importance of other factors such as geology and sediment supply
- the relative importance of ice thickness in different locations. In cold based regimes glacier movement and erosion is limited irrespective of ice thickness, in warm based regimes it has more influence.
- the inter-relationships between different factors that control rates of erosion e.g. ice thickness impacts on presence of meltwater and glacier velocity.

Credit other valid points not contained in the indicative content.

Award the marks as follows:		
	AO1 (5 marks)	**AO2.1c (3 marks)**
Band	*Demonstrates knowledge and understanding role of ice thickness as a control of glacial erosion.*	*Applies knowledge and understanding to assess the importance of ice thickness as a control of glacial erosion*.
3	**4-5 marks** Demonstrates accurate knowledge and understanding of ice thickness as a control of glacial erosion. Demonstrates accurate knowledge and understanding of other factors as controls of glacial erosion. Demonstrates accurate knowledge and understanding using appropriate and well-developed examples. Well annotated sketches / diagrams / maps may also be used and should be credited.	**3 marks** Applies knowledge and understanding to construct a well-developed and structured assessment of the importance of ice thickness as a control of glacial erosion. Applies knowledge and understanding to construct well-developed and balanced arguments, supported by appropriate evidence.
2	**2-3 marks** Demonstrates mostly accurate knowledge and understanding of ice thickness as a control of glacial erosion. Demonstrates mostly accurate knowledge and understanding of other factors as controls of glacial erosion. Demonstrates mostly accurate knowledge and understanding through the use of mostly appropriate examples which may not be fully developed. Generalised sketches / diagrams / maps may also be used and should be credited.	**2 marks** Applies partial knowledge and understanding to construct a partial assessment of the importance of ice thickness as a control of glacial erosion. Applies knowledge and understanding to construct partially developed and partially balanced arguments, supported by mostly appropriate evidence.
1	**1 mark** Demonstrates limited knowledge and understanding of ice thickness as a control of glacial erosion. Demonstrates limited knowledge and understanding of other factors as controls of glacial erosion. Demonstrates limited knowledge and understanding through the use of examples which are undeveloped. Basic sketches / diagrams / maps may also be used and should be credited.	**1 mark** Applies limited knowledge and understanding to construct a limited assessment of the importance role of ice thickness as a control of glacial erosion. Applies limited knowledge and understanding to construct limited arguments, supported by limited evidence.
	0 marks Response not creditworthy or not attempted.	**0 marks** Response not creditworthy or not attempted.

4. (a) (i) Use **Figure 4** to describe the pattern of flow velocity. Skills: 3.1	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
Award 1 mark for each valid point + 1 for development using data from map.					5		**5**

Indicative content

- Fastest at top of glacier / (North West) (1) 250+cm/yr (1)
- Rapid decrease in velocity at top of glacier (1) decreases by 100cm/yr in 50m (1)
- Rate of change in velocity slows towards the snout / end of the glacier (1) decreases by 50cm / yr across 200m (1)
- Stepped nature of change of velocity (1)
- Slower at sides of the glacier. (1) 0-49cm/yr (1)
- There is one area of slightly higher velocity of flow near the snout at the Northern edge. (1) 50-60 or 70cm / yr (1)

4. (a) (ii) Suggest **one** reason why the flow velocity varies. Content: 1.2.3	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
Award 1 mark for identification of valid reason and 2 marks for development related to the variations in velocity.			3				**3**

Indicative content

- Reason: Steepness of the slope (1) ice slides more rapidly on steeper slopes (1) more force pulling glacier downhill (1)
- Reason: Thawing of base of glacier (1) thicker ice near the top causes basal melting (1) – ice slides faster where lubrication at base (1)
- Reason: Friction (1) sides of glacier have friction with valley sides (1)– reduces velocity (1).
- Reason: Nature of bedrock (1) loose sediment beneath the glacier deforms easily (1) increasing flow velocity (1) hard or uneven rock applies more friction (1) slows velocity (1)
- Reason: Rough base / lumps in bedrock (1) increases friction (1) slows velocity (1)

Credit other valid points not contained in the indicative content.

4. (b) Examine the role of **one** mass movement process in the development of **one or more** periglacial landforms. Content: 1.2.8	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
	5			3			**8**

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks.

AO1
AO1 content encompasses knowledge and understanding of how mass movement processes contribute to the development of one or more periglacial landforms. The content may include knowledge and understanding of:

- rockfalls and their link to scree slopes and pro talus ramparts
- solifluction and its link to solifluction terraces and head deposits
- soil creep and link to terraces
- other process that may be important in the development of the selected landform[s] – ground ice [heave], wind, fluvial.

AO2
AO2 content encompasses the application of knowledge and understanding to analyse the role of one mass movement in the development of periglacial landforms. The content may include examination of:

- the contribution of selected mass movement
- the contribution of other mass movement processes
- the contribution of other geomorphic process
- the contribution of spatial variations the selected mass movement
- the changing contribution of mass movement over time.

Credit other valid points not contained in the indicative content.

Award the marks as follows:		
	AO1 (5 marks)	**AO2.1c (3 marks)**
Band	*Demonstrates knowledge and understanding of mass movement, and other, processes to the development of periglacial landforms.*	*Applies knowledge and understanding to appraise through examining the importance of mass movement processes to the development of periglacial landforms.*
3	**4-5 marks** Demonstrates accurate knowledge and understanding of how mass movement can contribute to the development of periglacial landforms. Demonstrates accurate knowledge and understanding of how other processes can contribute to the development of periglacial landforms. Demonstrates accurate knowledge and understanding using appropriate and well-developed examples. Well annotated sketches / diagrams / maps may also be used and should be credited.	**3 marks** Applies knowledge and understanding to construct a well-developed and structured assessment of the contribution of mass movement processes to the development of periglacial landforms. Applies knowledge and understanding to construct well-developed and balanced arguments, supported by appropriate evidence.
2	**2-3 marks** Demonstrates partial knowledge and understanding of how mass movement can contribute to the development of periglacial landforms. Demonstrates partial knowledge and understanding of how other processes can contribute to the development of periglacial landforms. Demonstrates partial knowledge and understanding through the use of mostly appropriate examples that may not be fully developed. Generalised sketches / diagrams / maps may also be used and should be credited.	**2 marks** Applies partial knowledge and understanding to construct a partial assessment of the impact of contribution of mass movement processes to the development of periglacial landforms. Applies knowledge and understanding to construct partially developed and partially balanced arguments, supported by mostly appropriate evidence.
1	**1 mark** Demonstrates limited knowledge and understanding of how mass movement can contribute to the development of periglacial landforms. Demonstrates limited knowledge and understanding of how other processes can contribute to the development of periglacial landforms. Demonstrates limited knowledge and understanding through the use of examples that are undeveloped. Basic sketches / diagrams / maps may also be used and should be credited.	**1 mark** Applies limited knowledge and understanding to construct a limited assessment of the impact of contribution of mass movement processes to the development of periglacial landforms. Applies limited knowledge and understanding to construct limited arguments, supported by limited evidence.
	0 marks Response not creditworthy or not attempted.	**0 marks** Response not creditworthy or not attempted.

Section B: Tectonic Hazards

5. (a) (i) Use **Figure 5a** to analyse the relative significance of the different causes of death. Skills: 2.5	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
Award 1 mark for each analytical point and 1 mark for data manipulation in support (max 1 for lifted data)					5		5

Indicative content

- Most/one third from pyroclastic flows (1) 33% (1)
- Significant number from indirect causes (1) approx. 24% (1)
- 4 significant causes of death (1) account for 91% of global deaths (1)
- Least deaths are from lightning (1) (0.05%) (1)
- 5 causes relatively insignificant (1) – gas/floods/lava/seismicity/lightning.
- 3 causes with less than 1000 deaths (1)

Marking guidance

Data used needs to support the relative significance of a particular cause of death. Candidates can be awarded 1 mark only for data lift.

5. (a) (ii) Use **Figures 5a and 5b** to examine the physical factors that may influence the number of deaths resulting from volcanic eruptions. Content: 1.3.1, 1.3.2	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
			9				**9**

Indicative content

Answers should refer to at least two of the factors shown in **Figures 5a and 5b** which are type of hazard, VEI and distance from the eruption. The question is AO2 and so there will need to be application of knowledge and not a simple description of the resources without an analysis of the inter-relationship between factor and mortality.

The content may include:

- an examination of the influence of **type of hazard** – some hazards produce few fatalities – ballistics, tephra, avalanche, some hazards produce large numbers of fatalities – lahars, pyroclastic flows
- an examination of the influence of **distance from eruption** – more fatalities closer to eruption, impact of distance on some hazards e.g. gas and ballistics, distance not as important with lahars [both number and occurrence of fatalities].
- an examination of the **influence of VEI** – related to both number and occurrence of fatalities – most of fatalities for lahars at VEI of 4 and below, pyroclastic flows have many at 4 and above.

Marking guidance

Credit other approaches that may integrate factors.

Award the marks as follows:	
	AO2.1b (9 marks)
Band	*Demonstrates applied knowledge and understanding of factors that may influence the number of deaths from volcanic activity.*
3	**7-9 marks** Applies knowledge and understanding to construct a well-developed and structured examination of factors that may influence the number of deaths from volcanic activity. Applies knowledge and understanding to construct well-developed and balanced arguments, supported by appropriate evidence.
2	**4-6 marks** Applies knowledge and understanding to construct a partial examination of factors that may influence the number of deaths from volcanic activity. Applies knowledge and understanding to construct partially developed and partially balanced arguments, supported by mostly appropriate evidence. Developed description of resources.
1	**1-3 marks** Applies knowledge and understanding to construct a limited examination of factors that may influence the number of deaths from volcanic activity. Applies knowledge and understanding to construct limited and basic arguments, supported by limited evidence. Simple description of resources.
	0 marks Response not creditworthy or not attempted.

5. (b) Briefly outline the characteristics of: (i) explosive eruptions (ii) effusive eruptions Content: 1.3.2	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
Award 1 mark for a valid comment with a further mark for developmental point on each characteristic.	4+4						**8**

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Comment could refer to the relevant processes operating, the products of eruption and the nature of the volcanic materials involved. These could be put into the context of tectonic setting. The content may include:

Explosive

- Viscous lava (1) slow flowing (1)
- High silica content (1)
- Andesitic or rhyolitic or acidic lava (1) relatively cool lava / (lower temperature / around 800 degrees) (1)
- High gas content (1) produces ash, pumice and pyroclastic debris (1)
- Violent eruption (do not credit repeat of explosive) (1)
- Found most commonly at converging margins (1)

Effusive

- Fluid lava /low viscosity (1)
- Low silica content (1)
- Basaltic or Basic lava (1)
- Relatively hot lava / hotter temperatures / around 1200 degrees (1)
- Low gas content (1) produces runny lava (1) fast flowing (1)
- Less violent eruption (1)
- Found most commonly at diverging margins (1)

Credit other valid points not contained in the indicative content.

6. (a) (i) State the range of percentage of ports exposed to lahars. Skills: 2.10	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
Award 1 mark for correct answer					1		**1**
Indicative content Accept 6% only as correct answer (10-4).							

6. (a) (ii) Calculate the mean percentage of main roads exposed to pyroclastic flows. Show your working. Skills: 2.9	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
					2		**2**
Indicative content Mean = 7% Working = (0+7+14)/3							

6. (b) Use the information in **Figure 6a** to suggest which hazard is the greatest threat to infrastructure. Content: 1.3.2	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
					5		**5**

Indicative content

- Lahars are a threat to a higher % of infrastructure overall – cities/roads/airports
- Ports threatened more by pyroclastic flows, except in Indonesia on average 10% of ports are threatened as opposed to an average of 7% threat from lahars.
- A higher % of cities are at risk from both lahars and pyroclastic flows, compared to other infrastructure
- Lahars higher threat overall in Indonesia
- Comparable threat from lahars in PNG and Philippines, though ports are more at risk in PNG and airports in Philippines

Credit other valid points not contained in the indicative content. Expect reference to a range of the countries shown for marks in Band 3.

Award the marks as follows:

	AO3 (5 marks)
Band	*Interpretation and analysis of resource evidence to show knowledge and understanding of the relative threat to infrastructure.*
3	**4-5 marks** Accurate interpretation and analysis of resources to show knowledge and understanding of the relative threat to infrastructure for the countries shown. Well-developed and balanced arguments, supported by appropriate evidence.
2	**2-3 marks** Mostly accurate interpretation and analysis of resources to show knowledge and understanding of the relative threat to infrastructure. Partially developed arguments, supported by some evidence.
1	**1 mark** Limited interpretation and analysis of resources to show knowledge and understanding of the relative threat to infrastructure. Limited arguments, supported by limited evidence.
	0 marks Response not creditworthy or not attempted.

6. (c) (i) Use **Figure 6b** to calculate the percentage of Indonesia's volcanoes that are not monitored. Give your answer to **one** decimal place. Show your working. Skills: 2.3	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
					3		**3**

Indicative content

Correct answer

= 49.3% (2) allow 1 mark only for 49% or 49.2%
Working = 70/142 (1)

6. (c) (ii) Use **Figure 6b** to compare risk levels for volcanoes that are not monitored and those that are monitored monthly. Skills: 2.3, 2.4	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
Award each valid comparative point 1 mark + 1 for supporting data					3		**3**

Indicative content

Those that are **not monitored** have:

- Fewer that are high risk (1) 12 compared to 29 for those monitored monthly (1)
- More that are medium risk (1) 35 compared to 24 for those monitored monthly (1)
- More that are low risk (1) 23 compared to 7 for those monitored monthly (1)

Accept reference to proportions in %.

6. (d) Use **Figures 6a – 6d** to examine human reasons why there may be variations in the severity of impacts associated with volcanic eruptions. Content: 1.3.4	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
		10					**10**

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks.

Candidates may use knowledge and understanding to examine the following human reasons for variations in the severity of impacts:

- how concentrations of infrastructure may influence vulnerability to volcanic eruptions
- how preparation/monitoring may cause variation in the impacts associated with volcanic eruptions
- how proximity of settlement may influence vulnerability to volcanic eruptions
- how size of settlement may influence vulnerability to volcanic eruptions
- how economic activity e.g. agriculture may influence vulnerability to volcanic eruptions.

Credit other valid points not contained in the indicative content.

Marking guidance

Do not credit analysis of purely physical reasons.

Award the marks as follows:	
	AO2.1a (10 marks)
Band	*Applies knowledge and understanding of factors to examine human factors that influence vulnerability to volcanic eruptions.*
3	**7-10 marks** Applies knowledge and understanding to construct well-developed and structured examination of the human factors that influence vulnerability to volcanic eruptions. Applies knowledge and understanding to construct well-developed and balanced arguments, supported by appropriate evidence.
2	**4-6 marks** Applies knowledge and understanding to construct a partial examination of human factors that influence vulnerability to volcanic eruptions. Applies knowledge and understanding to construct partially developed and partially balanced arguments, supported by mostly appropriate evidence.
1	**1-3 marks** Applies knowledge and understanding to construct a limited examination of the human factors that influence vulnerability to volcanic eruptions. Applies knowledge and understanding to construct limited and basic arguments, supported by limited evidence.
	0 marks Response not creditworthy or not attempted.

7. (a) Explain how the processes associated with earthquakes produce **one or more** hazards. Content: 1.3.3	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
	10						**10**

Indicative content

The question requires knowledge and understanding of how the processes associated with earthquakes produce one or more hazards, as listed in the specification. The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. The content may include an explanation of:

- the **processes** that form earthquakes – plate movement within the Earth's crust, stress build up, rock deformation, stored energy, stress exceeds the strength of the rock, rock fracture along a fault, stored energy is suddenly released as an earthquake
- seismic waves – p-waves and s-waves and their impacts on the earth's surface
- the hazard of **ground shaking**: it is both a hazard created by earthquakes and triggers other hazards such as liquefaction and landslides.
- how earthquakes can trigger **landslides**, especially in areas with water-saturated soils. Landslides may result in falling rocks and debris that collide with people and buildings

- the hazard of **liquefaction** where soil liquefies during ground shaking. Liquefaction can undermine the foundations and supports of buildings, bridges, pipelines, and roads, causing them to sink into the ground or collapse
- how earthquake processes can cause **secondary hazards** such as flooding and fire (credit tsunami although not included in AS specification).

Credit other valid points not contained in the indicative content.

Award the marks as follows:	
	AO1 (10 marks)
Band	*Demonstrates knowledge and understanding of how the processes associated with earthquakes produce one or more hazards.*
3	**7-10 marks** Demonstrates accurate knowledge and understanding of how the processes associated with earthquakes produce one or more hazards. Demonstrates accurate knowledge and understanding using appropriate and well-developed examples. Well annotated sketches / diagrams / maps may also be used and should be credited.
2	**4-6 marks** Demonstrates partial knowledge and understanding of how the processes associated with earthquakes produce one or more hazards. Demonstrates partial knowledge and understanding using mostly appropriate examples which may not be fully developed. Generalised sketches / diagrams / maps may also be used and should be credited.
1	**1-3 marks** Demonstrates limited knowledge and understanding of how the processes associated with earthquakes produce one or more hazards. Demonstrates limited knowledge and understanding using examples which are undeveloped. Basic sketches / diagrams / maps may be seen and can be credited.
	0 marks Response not creditworthy or not attempted.

7. (b) Examine the success of **one or more** long-term responses to the effects of earthquake hazards. Content: 1.3.5	AO1	AO2.1a	AO2.1b	AO2.1c	AO3		**Total**
	5			3			**8**

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks.

AO1
AO1 content encompasses knowledge and understanding of one method used to prepare for earthquakes. Long-term responses can be defined as methods that are used to prepare the population, buildings and infrastructure of an area to withstand the effects of an earthquake. Answers should show a knowledge and understanding of the selected method. The content will depend upon the method chosen and may include:

- Drills for population and emergency services
- Education of the population
- Assembling emergency supplies and disaster plans
- Land use planning
- Structural characteristics of buildings and/or infrastructure
- Communications systems
- Retrofitting.

AO2
AO2 content encompasses the application of knowledge and understanding to examine the success of the named method. The content may vary according to the response chosen but may include reference to:

- The level of alleviation of impacts
- Spatial variations in success of method
- Temporal variations in the success of the method
- Social variations in the success of the method
- Difference in success between earthquakes.

Credit other valid points not contained in the indicative content.

Marking guidance

If a candidate discusses short-term response, this is capped at max. 4 marks (3+1).

Award the marks as follows:		
	AO1 (5 marks)	**AO2.1c (3 marks)**
Band	*Demonstrates knowledge and understanding of long-term responses to earthquake hazards.*	*Applies knowledge and understanding to appraise through examination the success of the chosen method(s) of response.*
3	**4-5 marks** Demonstrates accurate knowledge and understanding of the selected method of response. Demonstrates accurate knowledge and understanding using appropriate and well-developed examples.	**3 marks** Applies knowledge and understanding to construct well-developed and structured examination of the success of the selected method of preparation. Applies knowledge and understanding to construct well-developed and balanced arguments, supported by appropriate evidence.
2	**2-3 marks** Demonstrates partial knowledge and understanding of the selected method of response. Demonstrates partial knowledge and understanding through the use of mostly appropriate examples which may not be fully developed.	**2 marks** Applies partial knowledge and understanding to construct partial examination of the success of the selected method of preparation. Applies knowledge and understanding to construct partially developed and partially balanced arguments, supported by mostly appropriate evidence.
1	**1 mark** Demonstrates limited knowledge and understanding of the selected method of response. Demonstrates limited knowledge and understanding through the use of examples which are undeveloped.	**1 mark** Applies limited knowledge and understanding to construct limited examination of the success of the selected method of preparation. Applies limited knowledge and understanding to construct limited arguments, supported by limited evidence.
	0 marks Response not creditworthy or not attempted.	**0 marks** Response not creditworthy or not attempted.