GCE

Geography

H481/01: Physical systems

A Level

Mark Scheme for June 2025

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

MARKING INSTRUCTIONS

PREPARATION FOR MARKING

RM ASSESSOR

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM Assessor Online Training: OCR Essential Guide to Marking*.

2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are available in RM Assessor

3. Log-in to RM Assessor and mark the **required number** of practice responses ("scripts") and the **required number** of standardisation responses.

MARKING

1. Mark strictly to the mark scheme.

2. Marks awarded must relate directly to the marking criteria.

3. The schedule of dates is very important. It is essential that you meet the RM Assessor 50% and 100% (traditional 40% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.

4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone, email or via the RM Assessor messaging system.

5. **Crossed-Out Responses**
   Where a candidate has crossed out a response and provided a clear alternative then the crossed-out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed-out response where legible.

   Rubric Error Responses – Optional Questions
   Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM Assessor, which will select the highest mark from those awarded. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

Multiple-Choice Question Responses
When a multiple-choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate).
When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.

Contradictory Responses
When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

Short Answer Questions (requiring only a list by way of a response, usually worth only one mark per response)
Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

Short Answer Questions (requiring a more developed response, worth two or more marks)
If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space).

Longer Answer Questions (requiring a developed response)
Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there, then add the annotation 'SEEN' to confirm that the work has been seen and mark any responses using the annotations in section 11.

7. There is a NR (**No Response**) option. Award NR (No Response):

   - if there is nothing written at all in the answer space
   - OR if there is a comment which does not in any way relate to the question (e.g., 'can't do', 'don't know')
   - OR if there is a mark (e.g., a dash, a question mark) which is not an attempt at the question.

   Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

8. The RM Assessor **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response:
    To determine the level – start at the highest level and work down until you reach the level that matches the answer
    To determine the mark within the level, consider the following

Descriptor	Award mark
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

11. **Annotations**

Annotation	Meaning
	Correct – for objective points-based mark schemes
SEEN	Point has been seen and noted
	Indicates a whole answer for which there is no credit
BP	Must be used on all blank pages where there is no candidate response
DEV	Development of a point
IRRL	Irrelevant; a significant amount of material that does not answer the question
L1	Level 1
L2	Level 2
L3	Level 3
NE	No place specific detail
PLC	Place specific detail
R	Rubric error (place at start of Question not being counted)
	Highlighting an issue e.g. irrelevant paragraph. Use in conjunction with another stamp e.g IRRL

12. **Subject Specific Marking Instructions**

INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper and its rubrics
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

USING THE MARK SCHEME

Please study this Mark Scheme carefully. The Mark Scheme is an integral part of the process that begins with the setting of the question paper and ends with the awarding of grades. Question papers and Mark Schemes are developed in association with each other so that issues of differentiation and positive achievement can be addressed from the very start.

This Mark Scheme is a working document; it is not exhaustive; it does not provide 'correct' answers. The Mark Scheme can only provide 'best guesses' about how the question will work out, and it is subject to revision after we have looked at a wide range of scripts.

The Examiners' Standardisation Meeting will ensure that the Mark Scheme covers the range of candidates' responses to the questions, and that all Examiners understand and apply the Mark Scheme in the same way. The Mark Scheme will be discussed and amended at the meeting, and administrative procedures will be confirmed. Co-ordination scripts will be issued at the meeting to exemplify aspects of candidates' responses and achievements; the co-ordination scripts then become part of this Mark Scheme.

Before the Standardisation Meeting, you should read and mark in pencil a number of scripts, in order to gain an impression of the range of responses and achievement that may be expected.

In your marking, you will encounter valid responses which are not covered by the Mark Scheme: these responses must be credited. You will encounter answers which fall outside the 'target range' of Bands for the paper which you are marking. Please mark these answers according to the marking criteria.

Please read carefully all the scripts in your allocation and make every effort to look positively for achievement throughout the ability range. Always be prepared to use the full range of marks.

LEVELS OF RESPONSE QUESTIONS:

The indicative content indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance.

Using 'best-fit', decide first which set of level descriptors best describes the overall quality of the answer. Once the level is located, adjust the mark concentrating on features of the answer which make it stronger or weaker following the guidelines for refinement.

Descriptor	Award mark
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

Be prepared to use the full range of marks. Do not reserve (e.g.) highest level marks 'in case' something turns up of a quality you have not yet seen. If an answer gives clear evidence of the qualities described in the level descriptors, reward appropriately.

Quality of extended response will be assessed in questions marked with an (*). Quality of extended response is not attributed to any single assessment objective but instead is assessed against the entire response for the question.

	AO1	AO2	AO3	Quality of extended response
Comprehensive	A wide range of detailed and accurate knowledge that demonstrates fully developed understanding that shows full relevance to the demands of the question. Precision in the use of question terminology.	Knowledge and understanding shown is consistently applied to the context of the question, in order to form a: Clear, developed and convincing analysis that is fully accurate. Clear, developed and convincing interpretation that is fully accurate. Detailed and substantiated evaluation that offers secure judgements leading to rational conclusions that are evidence based.	Quantitative, qualitative and/or fieldwork skills are used in a consistently appropriate and effective way and with a high degree of competence and precision.	There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.
Thorough	A range of detailed and accurate knowledge that demonstrates well developed understanding that is relevant to the demands of the question. Generally precise in the use of question terminology.	Knowledge and understanding shown is mainly applied to the context of the question, in order to form a: Clear and developed analysis that shows accuracy. Clear and developed interpretation that shows accuracy. Detailed evaluation that offers generally secure judgements,	Quantitative, qualitative and/or fieldwork skills are used in a suitable way and with a good level of competence and precision.	There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.

	AO1	AO2	AO3	Quality of extended response
		with some link between rational conclusions and evidence.		
Reasonable	Some sound knowledge that demonstrates partially developed understanding that is relevant to the demands to the question. Awareness of the meaning of the terms in the question.	Knowledge and understanding shown is partially applied to the context of the question, in order to form a: Sound analysis that shows some accuracy. Sound interpretation that shows some accuracy. Sound evaluation that offers generalised judgments and conclusions, with limited use of evidence.	Quantitative, qualitative and/or fieldwork skills are used in a mostly suitable way with a sound level of competence but may lack precision.	There information has some relevance and is presented with limited structure. The information is supported by limited evidence.
Basic	Limited knowledge that is relevant to the topic or question with little or no development. Confusion and inability to deconstruct terminology as used in the question.	Knowledge and understanding shows limited application to the context of the question in order to form a: Simple analysis that shows limited accuracy. Simple interpretation that shows limited accuracy. Un-supported evaluation that offers simple conclusions.	Quantitative, qualitative and/or fieldwork skills are used inappropriately with limited competence and precision.	The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.

Question			Answer	Mark	Guidance
1	(a)		**Explain the influence of flows of energy in the formation of a salt marsh.** **Level 3 (6-8 marks)** Demonstrates **thorough** knowledge and understanding of the influence of flows of energy in the formation of a salt marsh. (AO1). This will be shown by including **well-developed** ideas with a **clear** appreciation of the reasons for the influence of flows of energy in the formation of a salt marsh. **Level 2 (3-5 marks)** Demonstrates **reasonable** knowledge and understanding of the reasons for the influence of flows of energy in the formation of a salt marsh. This will be shown by including **developed** ideas with **some** appreciation of the reasons of the influence of flows of energy in the formation of a salt marsh. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of the reasons for the influence of flows of energy in the formation of a salt marsh (AO1). This will be shown by including **simple** ideas and with **no** or **limited** appreciation of the reasons for the influence of flows of energy in the formation of a salt marsh. **0 marks** No response or no response worthy of credit.	**8** **AO1 x8**	**Indicative content:** **AO1 – 8 marks** Knowledge and understanding of the reasons for the influence of flows of energy (e.g. thermal, kinetic, gravitational) in the formation of a salt marsh could potentially include: • As a spit develops across a river mouth kinetic energy in the channel reduces as the spit creates a barrier reducing speed causing increased deposition • In the widening sheltered area behind the spit, kinetic energy continues to reduce causing continued fluvial deposition creating mud flats exposed at low tide • On the margins of the salt marsh fluvial currents have higher kinetic energy (greater speed) as they can flow out to sea – these are likely to change with the tide • Flocculation of clay particles creates flocs which are heavier and require more energy to move • Over time energy levels in the salt marsh change as vegetation develops through thermal energy from the sun. This produces more friction, causing lower velocities and increased deposition as kinetic energy lowers • After further succession and development of creeks faster flow and greater kinetic energy will be found here as there is less friction • Salt marshes can also form in gently sloping inter-tidal zones where kinetic energy reduces due to friction leading to vertical deposition and salt marsh formation

Question			Answer	Mark	Guidance
1	(b)	(i)	**Study <u>TABLE 1</u>, which shows cliff erosion rates on the East Yorkshire Coast, UK. Using <u>TABLE 1</u>, calculate the mean rate of erosion. Show your workings.** • 1+2+0.25+1.5+0.8+1.1+0.75+2.2+1.9+3.1 / 10 (✓) or 14.6 / 10 (✓) • Mean value is 1.46 (✓)	**2** **AO3 x2**	**AO3 - 2 marks** 1 x 1 (✓) for calculating the mean rate of erosion using <u>TABLE 1</u>. 1 x 1 (✓) for showing workings.
1	(b)	(ii)	**The standard deviation for the rate of erosion in <u>TABLE 1</u> is 0.8. State what this indicates about the dispersion (spread) of the data set.** • The sample suggests that approximately 68% of the values (✓) lies in the range 0.66 - 2.26 (within 0.8 of the mean) (✓) • The sample is clustered around the mean / limited dispersion (✓) but there are a couple of locations more than one SD from the mean (e.g. Hornsea (0.25) (✓) • The sample suggests that 8/10 or 80% of the values (✓) lie within 1 SD of the mean / within 0.8 (✓)	**2** **AO3 x2**	**AO3 – 2 marks** 1 x 1 (✓) for general point about dispersion 2 x 1 (✓) for specific point about dispersion
1	(b)	(iii)	**Explain why standard deviation is a more accurate measure of dispersion (spread) than range <u>and</u> interquartile range.**	**2** **AO3 x2**	**AO3 – 2 marks** 1 x 1 (✓) for explanation of why standard deviation is more accurate than the range

Question			Answer	Mark	Guidance
			• Standard deviation is more useful than the range which only uses the maximum and minimum value so gives you limited information about the spread of data (✓) • Standard deviation is more useful than the range, as the range can be skewed by outliers/anomalies' (✓) • Standard deviation is more useful than the IQR which only uses half the values / the middle 50% of the data set (✓) • The range only uses the highest and lowest values (✓)		1 x 1 (✓) for explanation of why standard deviation is more accurate than the interquartile range
1	**(c)**		**Study <u>FIG. 1</u>, a coastal landscape in Norway.** **With reference to <u>FIG. 1</u>, explain the influence of <u>ONE</u> geomorphic process in shaping landform <u>A</u> (fjord<u>)</u>.** • Biological weathering where roots grow into cracks in the rock (✓) causing the rocks to break apart (DEV), creating landslides (DEV) • Mechanical weathering e.g. freeze-thaw where water gets into cracks in the rock face (✓). As it freezes it expands (DEV) causing disintegration and the formation of steep valley sides (DEV) • Marine erosion, such as abrasion at the base of valley sides, involves waves carrying rock particles that scour and wear away the rock (✓),	**3** **AO2 x3**	**Indicative content:** **AO2 – 3 marks** For analysing Fig. 1 to explain the influence of **<u>ONE</u>** geomorphic process in shaping landform <u>A</u> (fjord) • The original formation of the U shaped valley by glacial erosion is creditworthy • Naming a geomorphic process of its own is not sufficient for a mark. • A geomorphic process must be present within the answer to achieve full marks.

Question			Answer	Mark	Guidance
			leading to its removal (DEV) and potentially triggering mass movement (DEV) • As the ice moves down the valley, plucking would occur (✓) so the valley became deeper and wider (DEV)		
1	(d*)		**'Coastal landscape systems are influenced more by management strategies than by the unintentional impacts of economic development.' To what extent do you agree with this statement?** **AO1** **Level 3 (6-8 marks)** Demonstrates **thorough** knowledge and understanding of the influence of management strategies and economic development on coastal landscape systems. The answer should include **accurate place-specific** detail. **Level 2 (3-5 marks)** Demonstrates **reasonable** knowledge and understanding of the influence of management strategies and economic development on coastal landscape systems. The answer should include **place-specific** detail which is **partially accurate**. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of the influence of management strategies and economic development on coastal landscape systems.	**16** **AO1 x8** **AO2 x8**	**Indicative content** **AO1 – 8 marks** Knowledge and understanding of management strategies and economic development on coastal landscape systems could potentially include: • Influence of management strategies ○ Groynes – building the beach minimising movement of sediment influencing landforms down coast with increased erosion rates reducing beaches ○ Beach recharge – building up the beach annually ○ Recurved seawalls – reflecting waves to reduce erosion, results in less cliff collapse and less sediment carried so more erosion down coast ○ Influence of managed retreat on width of salt marshes • Influence of unintentional change caused by economic development ○ Sand dredging for construction resulted in wider, flatter beaches which are less effective at absorbing energy leading to more breached beaches, dunes and spits. ○ Breakwaters at ports/harbours may disrupt longshore sediment supply downdrift reducing size of beaches.

Question			Answer	Mark	Guidance
			There is an attempt to include **place-specific** detail but it is **inaccurate**. **0 marks** No response or no response worthy of credit. **AO2** **Level 3 (6-8 marks)** Demonstrates **thorough** application of knowledge and understanding to provide clear and developed analysis that shows accuracy. Includes a detailed evaluation that offers generally secure judgements, with some link between rational conclusions and evidence, of the extent to which coastal landscape systems are influenced more by management strategies than unintentional change caused by economic development. **Level 2 (3-5 marks)** Demonstrates **reasonable** application of knowledge and understanding to provide sound analysis that shows some accuracy. Includes a sound evaluation of the extent to which coastal landscape systems are influenced more by management strategies than unintentional change caused by economic development. Judgement and conclusions are generalised, with limited use of evidence. **Level 1 (1-2 marks)** Demonstrates **basic** application of knowledge and understanding to provide simple analysis that shows limited accuracy to provide an un-supported evaluation that offers simple conclusions of the extent to which coastal landscape systems are influenced more by		○ Construction on slopes/cliff tops adds weight increasing likelihood of mass movement. **AO2 – 8 marks** Apply knowledge and understanding to analyse and evaluate to what extent coastal landscape systems are influenced more by management strategies than unintentional change caused by economic development could potentially include: • Importance will vary depending on use of case study • Sandbanks, Dorset erosion rates lowered from 1.6m/yr building wider and deeper beach, and creating more mass movement and erosion at Barton Cliffs however, rotational slumping is continuing and new escarpments are being created regularly. • At Mangawhai-Pakiri, New Zealand rates of extraction are unsustainable in closed system, beaches being breached more and shape changing to be wider and flatter. Breaches have affected tidal currents increasing sedimentation, fore dunes undercut by waves causing more mass movement and aeolian erosion. Coastal retreat estimated at 35m, with width of coastal zone vulnerable to erosion between 48-111m by the end of the century • Economic development had greater impact – over time, also unsustainable indicating greater (irretrievable) impact, wider scale of impact e.g. widespread sedimentation of harbour and fore dunes undercut

Question			Answer	Mark	Guidance
			management strategies than unintentional change caused by economic development. **0 marks** No response or no response worthy of credit. **Quality of extended response** **Level 3** There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated. **Level 2** There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence. **Level 1** The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.		Highest level likely to refer to dynamic equilibrium / spatial / temporal variations.

Question			Answer	Mark	Guidance
2	(a)		**Explain the influence of flows of energy in the formation of a drumlin.** **Level 3 (6-8 marks)** Demonstrates **thorough** knowledge and understanding of the influence of flows of energy in the formation of a drumlin. (AO1). This will be shown by including **well-developed** ideas with a **clear** appreciation of the reasons for the influence of flows of energy in the formation of a drumlin. **Level 2 (3-5 marks)** Demonstrates **reasonable** knowledge and understanding of the reasons for the influence of flows of energy in the formation of a drumlin. This will be shown by including **developed** ideas with **some** appreciation of the reasons of the influence of flows of energy in the formation of a drumlin. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of the reasons for the influence of flows of energy in the formation of a drumlin (AO1). This will be shown by including **simple** ideas and with **no** or **limited** appreciation of the reasons for the influence of flows of energy in the formation of a drumlin. **0 marks** No response or no response worthy of credit.	**8** **AO1 x8**	**Indicative content:** **AO1 – 8 marks** Knowledge and understanding of the reasons for the influence of flows of energy (e.g. kinetic, thermal, gravitational) in the formation of a drumlin could potentially include: • A mound of glacial debris that has been streamlined into an elongated hill • Basal ice layers melt due to increased thermal energy caused by friction so subglacial debris gets caught in the uneven ground creating increased friction • This reduces kinetic energy as the glacier speed reduces encouraging more deposition • As glaciers re-advance (decrease in thermal energy, increase in accumulation) deposited material can be reshaped as glaciers have greater kinetic energy as they grow leading to increased erosion of deposits • If drumlins are in lowland areas, they can be formed as the ice thins due to increased thermal energy due to increased air temperatures or decrease in altitude, both contributing to thinner ice, with reduced energy to carry material, leading to increased deposition • A core of resistant rock in the path of the glacier reduced kinetic energy leading to deposition of large layers of till

Question			Answer	Mark	Guidance
2	(b)	(i)	**Study TABLE 2, which shows valley erosion rates along a glacier in India. Using TABLE 2, calculate the mean rate of erosion. Show your workings.** • 80+30+30+90+50+80+90+50+64+50 / 10 (✓) or 614 / 10 (✓) • Mean value is 61.4 (✓)	2 AO3 x2	**AO3 - 2 marks** 1 x 1 (✓) for calculating the mean rate of erosion using TABLE 2. 1 x 1 (✓) for showing workings.
2	(b)	(ii)	**The standard deviation for the rate of erosion in TABLE 2 is 21.7. State what this indicates about the dispersion (spread) of the data set.** • The sample suggests that approximately 68% of the values (✓) lies in the range 39.7 – 83.1 (within 21.7 of the mean) (✓) • The sample is fairly spread out around the mean / limited clustering (✓) but there are a couple of locations more than one SD from the mean e.g. Drang Dung (90) (✓) • The sample suggests that 6/10 or 60% of the values (✓) lie within 1 SD of the mean / within 21.7 (✓)	2 AO3 x2	**AO3 – 2 marks** 1 x 1 (✓) for general point about dispersion 2 x 1 (✓) for specific point about dispersion
2	(b)	(iii)	**Explain why standard deviation is a more accurate measure of dispersion (spread) than range and interquartile range.**	2 AO3 x2	**AO3 – 2 marks** 1 x 1 (✓) for explanation of why standard deviation is more accurate than the range 1 x 1 (✓) for explanation of why standard deviation is more accurate than the interquartile range

Question			Answer	Mark	Guidance
			• Standard deviation is more useful than the range which only uses the maximum and minimum value so gives you limited information about the spread of data (✓) • Standard deviation is more useful than the range, as the range can be skewed by outliers/anomalies' (✓) • Standard deviation is more useful than the IQR which only uses half the values / the middle 50% of the data set (✓) • The range only uses the highest and lowest values (✓)		
2	**(c)**		**Study <u>FIG. 2</u>, a periglacial landscape in Iceland. With reference to <u>FIG. 2</u>, explain the influence of <u>ONE</u> geomorphic process in forming landform <u>B</u> (patterned ground).** • Patterned ground is due to frost heave and the refreezing and expansion of the ground (✓) causing sediment to be lifted up (DEV). Then the stones roll down due to gravity causing the patterned ground (DEV) • Freeze- thaw weathering when water percolates into the bedrock below (✓) this freezes in the winter months expanding by 9-10% (DEV) growing the surface into domes causing deposition to settle at the base of the dome creating the polygon patterns (DEV)	**3** **AO2 x3**	**Indicative content:** **AO2 – 3 marks** For analysing Fig. 2 to explain the influence of **<u>ONE</u>** geomorphic process in forming landform <u>B</u> (patterned ground) • Naming a geomorphic process of its own is not sufficient for a mark. • A geomorphic process must be present within the answer to achieve full marks.

Question			Answer	Mark	Guidance

2	(d*)		**'Periglacial landscape systems are influenced more by human activity than glacial landscape systems.' To what extent do you agree with this statement?**
			
			AO1
			Level 3 (6-8 marks)
			Demonstrates **thorough** knowledge and understanding of the influence of human activity on glacial and periglacial landscape systems.
			
			The answer should include **accurate place-specific** detail.
			
			Level 2 (3-5 marks)
			Demonstrates **reasonable** knowledge and understanding of the influence of human activity on glacial and periglacial landscape systems.
			
			The answer should include **place-specific** detail which is **partially accurate**.
			
			Level 1 (1-2 marks)
			Demonstrates **basic** knowledge and understanding of the influence of human activity on glacial and periglacial landscape systems.
			
			There is an attempt to include **place-specific** detail but it is **inaccurate**.
			
			0 marks
			No response or no response worthy of credit.
				16
				AO1 x8
				AO2 x8
					Indicative content
					
					AO1 – 8 marks
					Knowledge and understanding of human activity on glacial and periglacial landscape systems could potentially include:
					• Human activity in periglacial environments
					  ○ Tourism – heli skiing and snowboarding, resort / airport construction, road building
					  ○ Mineral extraction – oil, Trans-Alaskan pipeline, road / building construction
					• Human activity in glacial environments
					  ○ HEP generation – dam construction
					  ○ Highland farming and forestry – mainly sheep farming and conifer plantations
					  ○ Tourism – skiing, mountain biking, hiking, resort / road construction
					
					AO2 – 8 marks
					
					Apply knowledge and understanding to analyse and evaluate the extent to which periglacial landscape systems are influenced more by human activity than glacial landscape systems. This could potentially include:
					• Importance will vary depending on use of case study
					• The annual variation in permafrost results in greater influence of human activity as more construction is needed to manage the human activity e.g. roads / pipelines on stilts which move as soil thaws during summer resulting in greater solifluction and solifluction lobes
					• In periglacial areas the urban heat island effect can increase the thermokarst creating alases

Question			Answer	Mark	Guidance
			AO2 **Level 3 (6-8 marks)** Demonstrates **thorough** application of knowledge and understanding to provide clear and developed analysis that shows accuracy. Includes a detailed evaluation that offers generally secure judgements, with some link between rational conclusions and evidence, of the extent to which periglacial landscape systems are influenced more by human activity than glacial landscape systems. **Level 2 (3-5 marks)** Demonstrates **reasonable** application of knowledge and understanding to provide sound analysis that shows some accuracy. Includes a sound evaluation of the extent to which periglacial landscape systems are influenced more by human activity than glacial landscape systems. Judgements and conclusions are generalised, with limited use of evidence. **Level 1 (1-2 marks)** Demonstrates **basic** application of knowledge and understanding to provide simple analysis that shows limited accuracy to provide an un-supported evaluation that offers simple conclusions of the extent to which periglacial landscape systems are influenced more by human activity than glacial landscape systems. **0 marks** No response or no response worthy of credit.		which are significant in area up to 50m in depth and 15km in length • Glacial HEP schemes have relatively little impact on glacial landforms – heat from the dam reduces glacial advance, however, systems are usually built where rivers flow so glacial advance is further upstream • Sand and gravel extraction in glacial areas often use glacial deposits in areas of ablation reducing impact on glacial environment, however quarrying landscape significantly impacts slope stability increasing risk of landslides Highest level likely to refer to dynamic equilibrium / spatial / temporal variations.

Question			Answer	Mark	Guidance
			Quality of extended response **Level 3** There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated. **Level 2** There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence. **Level 1** The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.		

Question			Answer	Mark	Guidance
3	(a)		**Explain the influence of flows of energy in the formation of a linear dune.** **Level 3 (6-8 marks)** Demonstrates **thorough** knowledge and understanding of the influence of flows of energy in the formation of a linear dune. (AO1). This will be shown by including **well-developed** ideas with a **clear** appreciation of the reasons for the influence of flows of energy in the formation of a linear dune. **Level 2 (3-5 marks)** Demonstrates **reasonable** knowledge and understanding of the reasons for the influence of flows of energy in the formation of a linear dune This will be shown by including **developed** ideas with **some** appreciation of the reasons of the influence of flows of energy in the formation of a linear dune. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of the reasons for the influence of flows of energy in the formation of a linear dune (AO1). This will be shown by including **simple** ideas and with **no** or **limited** appreciation of the reasons for the influence of flows of energy in the formation of a linear dune. **0 marks** No response or no response worthy of credit.	**8** **AO1 x8**	**Indicative content:** **AO1 – 8 marks** Knowledge and understanding of the reasons for the influence of flows of energy (e.g. kinetic, thermal, gravitational) in the formation of a linear dune could potentially include: • A linear dune is straight or slightly curved • They form parallel to the bimodal wind which pushes the sand in one direction • Thermal energy from sun creates winds • Thermal energy can also dry and harden sand making it easier to transport • Kinetic energy from the wind pushes sand by creep and saltation up the slope • Sand will be deposited on the slope as friction increased which reduces kinetic energy • Converging wind directions create two slip faces where kinetic wind energy builds up slope angle • Gravitational potential energy increases as sand accumulates on the slope therefore the slope angle increases until angle of repose is exceeded and energy is released as kinetic energy in a mini avalanche

Question			Answer	Mark	Guidance
3	(b)	(i)	**Study TABLE 3, which shows canyon erosion rates in a dryland landscape in China. Using TABLE 3, calculate the mean rate of erosion. Show your workings.** • 3.5+3.5+1+0.5+2+3+1+0.7+2.8+1.6 / 10 (✓) or 19.6 / 10 (✓) • Mean value is 1.96 (✓)	**2** **AO3 x2**	**AO3 - 2 marks** 1 x 1 (✓) for calculating the mean rate of erosion using TABLE 3. 1 x 1 (✓) for showing workings.
3	(b)	(ii)	**The standard deviation for the rate of erosion in TABLE 3 is 1.11. State what this indicates about the dispersion (spread) of the data set.** • The sample suggests that approximately 68% of the values (✓) lies in the range 0.85 – 3.07 (within 1.11 of the mean) (✓) • The sample is fairly spread out around the mean / limited clustering (✓) there are locations more than one SD from the mean e.g. Kashi (0.7) (✓) • The sample suggests that 6/10 or 60% of the values (✓) lie within 1 SD of the mean / within 1.96 (✓)	**2** **AO3 x2**	**AO3 – 2 marks** 1 x 1 (✓) for general point about dispersion 2 x 1 (✓) for specific point about dispersion
3	(b)	(iii)	**Explain why standard deviation is a more accurate measure of dispersion (spread) than range and interquartile range.** • Standard deviation is more useful than the range which only uses the maximum and	**2** **AO3 x2**	**AO3 – 2 marks** 1 x 1 (✓) for explanation of why standard deviation is more accurate than the range 1 x 1 (✓) for explanation of why standard deviation is more accurate than the interquartile range

Question			Answer	Mark	Guidance
			minimum value so gives you limited information about the spread of data (✓) • Standard deviation is more useful than the range, as the range can be skewed by outliers/anomalies' (✓) • Standard deviation is more useful than the IQR which only uses half the values / the middle 50% of the data set (✓) • The range only uses the highest and lowest values (✓)		
3	**(c)**		**Study <u>FIG. 3</u>, a dryland landscape in Chad.** **With reference to <u>FIG. 3</u>, explain the influence of <u>ONE</u> geomorphic process in shaping landform <u>C</u> (nivation hollow).** • Freeze thaw weathering occurs when melt water seeps into cracks in the rock (✓) as it freezes it expands exerting pressure (DEV) causing the rock to break up / disintegrate (DEV) • Pressure causes ice at the base to melt (✓) causing abrasion as weathered material scrapes the floor (DEV), deepening nivation hollow / removing more rock (DEV) • Rill wash – weathered material is deposited in meltwater streams (✓), abrasion deepens channel allowing weathered material to move (DEV), deepening nivation hollow (DEV)	**3** **AO2 x3**	**Indicative content:** **AO2 – 3 marks** For analysing Fig. 3 to explain the influence of **<u>ONE</u>** geomorphic process in shaping landform <u>C</u> (nivation hollow) • Naming a geomorphic process of its own is not sufficient for a mark. • A geomorphic process must be present within the answer to achieve full marks.

Question			Answer	Mark	Guidance
3	(d*)		**'Dryland landscape systems are influenced more by human activity, due to water supply issues, than by economic activity.'** **To what extent do you agree with this statement?** **AO1** **Level 3 (6-8 marks)** Demonstrates **thorough** knowledge and understanding of the influence of human activity on dryland landscape systems. The answer should include **accurate place-specific** detail. **Level 2 (3-5 marks)** Demonstrates **reasonable** knowledge and understanding of the influence of human activity on dryland landscape systems. The answer should include **place-specific** detail which is **partially accurate**. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of the influence of human activity on dryland landscape systems. There is an attempt to include **place-specific** detail but it is **inaccurate**. **0 marks** No response or no response worthy of credit. **AO2** **Level 3 (6-8 marks)**	**16** **AO1 x8** **AO2 x8**	**Indicative content** **AO1 – 8 marks** Knowledge and understanding of human activity on dryland landscape systems could potentially include: • Human activity due to water supply issues ○ Dam construction altering flows of water, making discharge more consistent ○ Velocity reduced behind dams causing deposition in lake and sediment starvation downstream • Economic activity in a dryland landscape system ○ Tourism – off road driving, hiking, mountain biking, camping, quad biking ○ Damage to crytobiotic crusts, dune equilibrium, increased dust storms and wind erosion **AO2 – 8 marks** Apply knowledge and understanding to analyse and evaluate the extent to which dryland landscape systems are influenced more by human activity, due to water supply issues, than by economic activity. This could potentially include: • Importance will vary depending on use of case study • Economic activity has a greater influence as hikers can damage crytobiotic crust with one footstep and it takes 50 years to recover • Human activity due to water supply issues is more influential as limiting floods causes sand bars to disappear and sand bars at the edge of the flood plain degrade – the area affected by

Question			Answer	Mark	Guidance
			Demonstrates **thorough** application of knowledge and understanding to provide clear and developed analysis that shows accuracy. Includes a detailed evaluation that offers generally secure judgements, with some link between rational conclusions and evidence regarding the extent to which dryland landscape systems are influenced more by human activity, due to water supply issues, than by economic activity. **Level 2 (3-5 marks)** Demonstrates **reasonable** application of knowledge and understanding to provide sound analysis that shows some accuracy. Includes a sound evaluation regarding the extent to which dryland landscape systems are influenced more by human activity, due to water supply issues, than by economic activity. Judgements and conclusions are generalised, with limited use of evidence **Level 1 (1-2 marks)** Demonstrates **basic** application of knowledge and understanding to provide simple analysis that shows limited accuracy to provide an un-supported evaluation that offers simple conclusions regarding the extent to which dryland landscape systems are influenced more by human activity, due to water supply issues, than by economic activity. **0 marks** No response or no response worthy of credit. **Quality of extended response** **Level 3**		the dam is significantly larger than a footprint on crytobiotic crust • Human activity due to water supply issues is more influential as wadis are shortened significantly affecting the size of landforms over a large area, as well as the loss of sand bars which reduce the input of sand into dunes degrading them significantly • Glen Canyon 1963 damming of Colorado River had biggest impact. Average daily flows exceeded 850 cumecs only 3% of the time compared with 18% before 1963. At the same time low flows became less frequent – flows of less than 140cumecs occur 10% of the time compared to 18% prior to the dam Highest level likely to refer to dynamic equilibrium / spatial / temporal variations.

Question			Answer	Mark	Guidance
			There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated. **Level 2** There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence. **Level 1** The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.		

Question			Answer	Mark	Guidance
4	(a)	(i)	**Study Fig. 4 which shows atmospheric carbon dioxide, 1960-2021.** **Identify <u>THREE</u> limitations of this graph.** • Lack of information on potential bias – who has recorded the information and why (✓) • Timeline relatively short for global atmospheric carbon change (✓) • No key to indicate difference between the two types of line on the graph (✓) • The two lines on the graph are the same colour so hard to distinguish them (✓) • The graph does not indicate where the data was collected / located (✓) • Intervals on the scale are too broad so you can't read precise data (✓) • Data only shows to 2021 so is outdated (✓) • Difficult to read accurate data measurements (✓) • Does not show temporal variations (diurnal / monthly) (✓)	**3** **AO3 x3**	**AO3 – 1 marks** 3 x 1 (✓) for identification of limitations of this line graph. Allow any appropriate limitation
4	(a)	(ii)	**Suggest why it is important to identify and record changes to the global carbon cycle.** • The potential damage of increasing atmospheric carbon is widespread (✓) so monitoring is essential, enabling effective management to be implemented e.g. carbon capture (DEV) • Monitoring allows us to identify trends / patterns (✓) allowing appropriate mitigation strategies / management to be implemented (DEV) • Records of change allow GIS mapping showing anomalies and trends effectively (✓) illustrating	**4** **AO2 x4**	**AO2 – 4 marks** 4 x 1 (✓) for appropriate reasons, or 3 x 1 (✓) for appropriate reasons and 1 x 1 (DEV) for three reasons with one developed or 2 x 1 (✓) and 2 x 1 (DEV) for two appropriate reasons and development or 1 x 1 (✓) and 3 x 1 (DEV) for one appropriate reason with extended development of why it is important to identify and record changes to the global carbon cycle.

Question			Answer	Mark	Guidance
			need for different levels of management or mitigation across the world (DEV) • Carbon is vital for life so it's important to monitor changes (✓) and the impact of anthropogenic emissions through burning fossil fuels (DEV) which allows evidence for mitigation strategies (DEV) • We need to monitor the carbon cycle to identify thresholds to see if we are reaching a tipping point (✓) so we can understand what may be causing these changes (DEV) and therefore implement appropriate mitigation (DEV). We can also evaluate the effectiveness of this mitigation through continuous monitoring (DEV)		
4	**(b)**		**Examine the significance of the role of the cryosphere (ice) in linking the water and carbon cycles.** **Level 3 (7-10 marks)** Demonstrates **thorough** knowledge and understanding of the role of the cryosphere (ice) in linking the water and carbon cycles (AO1). Demonstrates **thorough** application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements with some links between rational conclusions and evidence regarding the significance of the role of cryosphere (ice) in linking the water and carbon cycles (AO2).	**10** **AO1 6** **AO2 4**	**Indicative content** **AO1 – 6 marks** Knowledge and understanding of the role of the cryosphere (ice) in **linking** the water and carbon cycles could potentially include: • Cryosphere is a store of both water and carbon • Rising temperature results in melting of the cryosphere. This leads to the release of carbon to the atmosphere, further increasing temperatures so more ice melts and pools of water can gather on the surface due to limited infiltration • Melting of the cryosphere results in some plant growth, which requires water for photosynthesis. As plants grow, they take in more CO_2 from the atmosphere • Permafrost melting exposes organic material to oxidation and decomposition which releases

Question			Answer	Mark	Guidance
			This will be shown by including **well-developed** ideas about the significance of the role of cryosphere (ice) in linking the water and carbon cycles. **Level 2 (4-6 marks)** Demonstrates **reasonable** knowledge and understanding of the role of cryosphere (ice) in linking the water and carbon cycles (AO1). Demonstrates **reasonable** application of knowledge and understanding to provide a sound evaluation that offers generalised judgements and conclusions, with limited use of evidence regarding the significance of the role of cryosphere (ice) in linking the water and carbon cycles (AO2). This will be shown by including **developed** ideas about the significance of the role of cryosphere (ice) in linking the water and carbon cycles. **Level 1 (1–3 marks)** Demonstrates **basic** knowledge and understanding of the role of cryosphere (ice) in linking the water and carbon cycles (AO1). Demonstrates **basic** application of knowledge and understanding to provide an evaluation about the significance of the role of cryosphere (ice) in linking the water and carbon cycles (AO2). This will be shown by including **some** ideas about the significance of the role of cryosphere (ice) in linking the water and carbon cycles.		CO_2 and CH4. This causes a rise in temperatures and further melting which can increase surface run off • CO_2 levels in the atmosphere determine the intensity of the greenhouse effect and the melting of the cryosphere. Due to the impermeability of the permafrost, water can pool on the surface leading to limited evaporation taking place **AO2 – 4 marks** Apply knowledge and understanding to provide a detailed evaluation of the significance of the role of the cryosphere (ice) in linking the water and carbon cycles could potentially include: • Significance could be in terms of temporal or spatial scales e.g. seasonal change, short term cycling is significant to continual functioning of the cycles • Disturbance of the cycles in equilibrium and subsequent positive or negative feedback e.g. reduced precipitation, means less water to be accumulated in glaciers • Decomposition very slow reducing carbon content in the soil (only 0.01%) • Consideration of how significance varies with temperature e.g. seasonal variations • The extent to which the role of cryosphere links the cycles is of limited significance when compared to other links e.g. vegetation and animals combined contain 2000 billion tonnes of carbon, whereas oceans contain 38,000 giga tonnes of carbon – however all required to keep the cycles functioning

Question			Answer	Mark	Guidance
			0 marks No response or no response worthy of credit.		
4	**(c*)**		**'Improving forestry techniques protects the global water cycle more effectively than drainage basin planning'. How far do you agree with the statement?** **AO1** **Level 3 (6–8 marks)** Demonstrates **thorough** knowledge and understanding of forestry techniques, drainage basin planning and global water cycle. The answer should include **accurate place-specific detail**. **Level 2 (3–5 marks)** Demonstrates **reasonable** knowledge and understanding of forestry techniques, drainage basin planning and global water cycle. The answer should include **some place-specific detail which is partially accurate**. **Level 1 (1–2 marks)** Demonstrates **basic** knowledge and understanding of forestry techniques, drainage basin planning and global water cycle. There is an attempt to include **place-specific detail but it is inaccurate.**	**16** **AO1 8** **AO2 8**	**Indicative content** **AO1 – 8 marks** Knowledge and understanding of forestry techniques, drainage basin planning and global water cycle could potentially include: • Forestry techniques e.g. afforestation, protection schemes e.g. REDD / FCPF / ARPA • Drainage basin planning e.g. scale appropriate for holistic management between users, flow targets, surface water storage • Global water cycle • Processes e.g. infiltration, percolation, precipitation, transpiration, condensation, evaporation • Stores e.g. channel, atmosphere, vegetation, surface, soil moisture, groundwater **AO2 – 8 marks** Apply knowledge and understanding to analyse and evaluate whether improved forestry techniques protects the global water cycle more effectively than drainage basin planning could potentially include: • Expect range of evaluation – candidates may compare over temporal or spatial scales • Role in protecting global water cycle can vary depending on use of case study • Drainage basin planning allows for targets to be set across a variety of flows e.g. reducing run-off which could include afforestation to do that, however drainage basin planning includes a

Question			Answer	Mark	Guidance
			0 marks No response or no response worthy of credit. **AO2** **Level 3 (6-8 marks)** Demonstrates **thorough** application of knowledge and understanding to provide a clear and developed analysis that shows accuracy. Includes a detailed evaluation that offers generally secure judgements, with some link between rational conclusions and evidence regarding whether improved forestry techniques protects the global water cycle more effectively than drainage basin planning. **Level 2 (3-5 marks)** Demonstrate **reasonable a**pplication of knowledge and understanding to provide a sound analysis that shows some accuracy. Includes a sound evaluation about whether improved forestry techniques protects the global water cycle more effectively than drainage basin planning. Judgements and conclusions are generalised, with limited use of evidence. **Level 1 (1-2 marks)** Application of knowledge and understanding is **basic**. Analysis is simple with limited accuracy. Evaluation is un-supported and offers simple conclusions with regard to whether improved forestry techniques protects the global water cycle more effectively than drainage basin planning. **0 marks** No response or no response worthy of credit.		more holistic management of the drainage basin which is more effective as it addresses the system as a whole e.g. including water quality and abstraction rates within the basin • Afforestation is more effective for LIDCs and EDCs e.g. Brazil where afforestation has stabilised the regional water cycle, supported indigenous forest communities and promoted ecotourism encouraging small scale local communities and bringing sustainable economic options. Promoting social and economic sustainability makes it more likely that this action will continue, which influences the global water cycle more • Afforestation offsets 430 million tonnes of carbon per annum in Brazil alone having a significant impact on the global water cycle as this reduces global warming • The effectiveness of improving forest techniques can vary according to the political leadership at the time eg Bolsonaro v Lula da Silva • Drainage basin planning is more effective at a global scale as it includes a wider variety of management that can target a variety of stores rather than just vegetation e.g. reducing artificial drainage, or increasing flood storage areas, restricting floodplain development Highest level likely to refer to dynamic equilibrium / spatial variations / temporal variations

Question			Answer	Mark	Guidance
			Quality of extended response **Level 3** There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated. **Level 2** There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence. **Level 1** The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.		

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