GCE

Geography

H481/01: Physical systems

A Level

Mark Scheme for June 2023

Oxford Cambridge and RSA Examinations

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 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 posted on the RM Cambridge Assessment Support Portal http://www.rm.com/support/ca

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

   YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

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 or the RM Assessor messaging system, or by email.

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 a tick to confirm that the work has been seen.

7. Award No Response (NR) if:
    - there is nothing written in the answer space

Award Zero ‘0’ if:

- anything is written in the answer space and is not worthy of credit (this includes text and symbols).

Team Leaders must confirm the correct use of the NR button with their markers before live marking commences and should check this when reviewing scripts.

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.**
If you have any questions or comments for your team leader, use the phone, the RM Assessor messaging system, or e-mail.

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:
    a. **To determine the level –** start at the highest level and work down until you reach the level that matches the answer
    b. **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
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
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.

In your marking, you may encounter valid responses which are not covered by the Mark Scheme: these responses must be credited.
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.

Highest mark: If clear evidence of all the qualities in the level descriptors is shown, the HIGHEST Mark should be awarded.

Lowest mark: If the answer shows the candidate to be borderline (i.e. they have achieved all the qualities of the levels below and show limited evidence of meeting the criteria of the level in question) the LOWEST mark should be awarded.

Middle mark: This mark should be used for candidates who are secure in the level. They are not 'borderline' but they have only achieved some of the qualities in the level descriptors.

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)		**With reference to a <u>CASE STUDY</u> of <u>ONE</u> coastal landscape that is being used by people, explain the reasons for the economic development taking place.** **Level 3 (6-8 marks)** Demonstrate **thorough** knowledge and understanding of the reasons for economic development in <u>ONE</u> coastal landscape. (AO1). This will be shown by including **well-developed** ideas with a **clear** appreciation of the reasons for economic development in <u>ONE</u> coastal landscape. **Level 2 (3-5 marks)** Demonstrate **reasonable** knowledge and understanding of the reasons for economic development in <u>ONE</u> coastal landscape (AO1). This will be shown by including **developed** ideas with **some** appreciation of the reasons for economic development in <u>ONE</u> coastal landscape. **Level 1 (1-2 marks)** Demonstrate **basic** knowledge and understanding of the reasons for economic development in <u>ONE</u> coastal landscape (AO1). This will be shown by including **simple** ideas with **no** or **limited** appreciation of the reasons for economic development in <u>ONE</u> coastal landscape. **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 economic development in <u>ONE</u> coastal landscape could potentially include: • reasons will vary across different coastal landscape systems • will likely refer to economic development studied in the context of it causing unintentional change • tourism linked to the attractiveness of landscape, climate and coastal features • leisure and recreation activities e.g. water sports in shallow, safe water • fishing or other industry requiring use of harbour or port entrance • extraction of resources for economic development e.g. sand mining, fish, wind power, wave power Candidates can achieve L3 for one type of economic development

1	(b)	(i)	**Study <u>TABLE 1</u>, which shows mean monthly wind speed for a coastal location in South Africa for 11 months during 2019. Using the data in <u>TABLE 1</u>, calculate the median. You must show your working.** Order values from lowest to highest (or vice versa) 3.6, 3.8, 4.4, 4.4, 4.5, 4.5, 5.2, 5.3, 5.5, 5.5, 6.1 (✓) Median value is the 6th value = 4.5 (✓)	**2** **AO3 x2**	**AO3 – 2 marks** 1 x 1 mark for correct working (✓) 1 x 1 mark for correct answer (✓)
1	(b)	(ii)	Using the data in **Table 1**, calculate the interquartile range. You must show your working. IQR =5.5 (UQ) – 4.4 (LQ) (✓) = 1.1m/sec (✓)	**2** **AO3 x2**	**AO3 – 2 marks** 1 x 1 mark for correct working (✓) 1 x 1 mark for correct answer (✓) Units not required If 1bi working is incorrect, allow IQR calculation based on their working shown in 1bi
1	(b)	(iii)	**The mean wind speed for December 2019 was 9.4 m/s. Interpret this value with reference to the interquartile range for <u>TABLE 1</u>.** • The value 9.4mm is outside the dispersion of 50%/the majority of the values of the dataset (✓), it is an anomaly or extreme value (DEV).	**2** **AO3 x2**	**AO3 – 2 marks** 1 x 1 mark (✓) 1 x 1 mark (DEV) • Stating the relationship of the value to the interquartile range (✓) • Interpretation of value as anomaly / extreme (DEV)
1	(c)		**Study <u>FIG. 1</u>, a coastal landscape in England. With reference to <u>FIG. 1</u>, explain <u>ONE</u> way flows of material influence the formation of landform <u>A.</u>** • Waves move material across the gently sloping platform during the transitions from high tide to	**3** **AO2 x3**	1 x (✓) and 2 x DEV for analysing <u>FIG. 1</u> to explain <u>ONE</u> way flows of material influence the formation of landform A (shore platform). **Must have explicit reference to material for credit.**

			low tide and back again (✓). Deep scours caused by abrasion (DEV) as this material is dragged across the surface are shown in easterly direction on landform (DEV) - Material in the waves will cause abrasion at the foot of the cliff during high tide (✓), contributing to undercutting (DEV), collapse and retreat of the cliff over time (DEV) - Weathering and/or mass movement of material (from cliffs) to the platform provides material (✓) - When rock debris is too large to be removed by the waves, it will build up on the platform (✓) - Hydraulic action at cliff base (✓) creates a wave cut notch (DEV) resulting in mass movement (DEV)		
1	(d)*		**Discuss the relative importance of geomorphic processes in forming coastal landforms.** **AO1** **Level 3 (6-8 marks)** Demonstrates **comprehensive** knowledge and understanding of geomorphic processes in forming coastal landforms. The answer should include **accurate place-specific** detail. **Level 2 (3-5 marks)** Demonstrates **thorough** knowledge and understanding of geomorphic processes in forming coastal landforms. The answer should include **place-specific** detail which is **partially accurate**. **Level 1 (1-2 marks)**	**16** **AO1 x8** **AO2 x8**	**Indicative content** **AO1 – 8 marks** Knowledge and understanding of the geomorphic processes in forming coastal landforms could potentially include: - Weathering – physical, chemical, biological - Mass movement – rockfall, slides - Wave processes – erosion, transportation, deposition - Fluvial processes – erosion, transportation, deposition - Aeolian processes – erosion, transportation, deposition **AO2 – 8 marks**

			Demonstrates **basic** knowledge and understanding of geomorphic processes in forming coastal landforms. 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 **comprehensive** application of knowledge and understanding to provide clear and developed analysis that shows accuracy to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions and evidence, of the relative importance of geomorphic processes in forming coastal landforms. **Level 2 (3-5 marks)** Demonstrates **thorough** application of knowledge and understanding to provide sound analysis that shows some accuracy to provide a sound evaluation that offers generalised judgements and conclusions, with limited use of evidence, of the relative importance of geomorphic processes in forming coastal landforms. **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 relative importance of geomorphic processes in forming coastal landforms. **0 marks** No response or no response worthy of credit. **Quality of extended response**		Apply knowledge and understanding to analyse and evaluate the relative importance of geomorphic processes and other factors in forming coastal landforms could potentially include: • Importance will vary depending on use of case study, or landforms • Importance of current climatic conditions e.g. without temperatures fluctuating around freezing mechanical weathering processes e.g. freeze thaw cannot take place and are limited • Importance of past and future climatic changes resulting in cooling or warming climates e.g. without the Flandrian Transgression rias and fjords would not be submerged. The role of geomorphic processes is powered by the past significant sea level rise • Importance of human activity both deliberate and unintentional e.g. sea walls slow rates of erosion, cliff drainage slows rates of mass movement, groynes restrict longshore drift • Present day weather conditions e.g. wind speed and direction can influence rates of erosion • Other factors may be discussed e.g. lithology and structure

			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
2	(a)		**With reference to a <u>CASE STUDY</u> of <u>ONE</u> glaciated landscape that is being used by people, explain the reasons for the human activity taking place.** **Level 3 (6-8 marks)** Demonstrate **thorough** knowledge and understanding of the reasons for human activity within <u>ONE</u> glaciated landscape (AO1). This will be shown by including **well-developed** ideas with a **clear** appreciation of the reasons for human activity within <u>ONE</u> glaciated landscape. **Level 2 (3-5 marks)** Demonstrate **reasonable** knowledge and understanding of the reasons for human activity within <u>ONE</u> glaciated landscape (AO1). This will be shown by including **developed** ideas with **some** appreciation of the reasons for human activity within <u>ONE</u> glaciated landscape. **Level 1 (1-2 marks)** Demonstrate **basic** knowledge and understanding of the reasons for human activity within <u>ONE</u> glaciated landscape (AO1). This will be shown by including **simple** ideas with **no** or **limited** appreciation of the reasons for human activity within <u>ONE</u> glaciated landscape. **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 human activity within <u>ONE</u> glaciated landscape could potentially include: • reasons will vary across different glaciated landscape systems and different human activities • human activity can refer to deliberate and intentional change or economic development • presence of raw materials e.g. slate, limestone • potential for power supply e.g. hydroelectric or wind power • attractions for tourism of landscape and landforms e.g. climbing/hiking, ski-ing • need for economic development in the area to support employment and boost local economy • diversify local economy e.g. power as well as tourism Candidates can achieve L3 for one example of human activity.

2	(b)	(i)	**Study <u>TABLE 2</u>, which shows mean monthly precipitation for a glaciated location in Canada for 11 months during 2019. Using the data in <u>TABLE 2</u>, calculate the median. You must show your working.** Order values from lowest to highest (or vice versa) 110, 120, 140, 160, 185, 190, 210, 240, 250, 280, 390 (✓) Median value is the 6th value = 190 (✓)	**2** **AO3 x2**	**AO3 – 2 marks** 1 x 1 mark for correct working (✓) 1 x 1 mark for correct answer (✓)
2	(b)	(ii)	**Using the data in <u>TABLE 2</u>, calculate the inter-quartile range. You must show your working.** IQR= 250mm (UQ) – 140mm (LQ) (✓) = 110mm (✓)	**2** **AO3 x2**	**AO3 – 2 marks** 1 x 1 mark for correct working (✓) 1 x 1 mark for correct answer (✓) Units not required If 2bi working is incorrect, allow IQR calculation based on their working shown in 2bi
2	(b)	(iii)	**The mean monthly precipitation for December in 2019 was 370mm. Interpret this value with reference to the interquartile range for <u>TABLE 2</u>.** • The value 370mm would be outside the dispersion of 50%/the majority of the values of the dataset (✓), it is an anomaly/extreme value (DEV)	**2** **AO3 x2**	**AO3 – 2 marks** 1 x 1 mark (✓) 1 x 1 mark (DEV) • State the relationship of the value to the interquartile range (✓) • Interpretation of value as anomaly / extreme (DEV)
2	(c)		**Study <u>FIG.2</u>, a glaciated landscape in England. With reference to <u>FIG. 2</u>, explain <u>ONE</u> way flows of material influence the formation of landform <u>B</u>.**	**3** **AO2 x3**	• 1 x (✓) 2 x (DEV) for analysing <u>FIG. 2</u> to explain <u>ONE</u> way flows of material influence the formation of landform <u>B</u> (roche moutonnée).

			• Subglacial debris causes abrasion to occur on the valley floor (✓) eroding less resistant rock (DEV) around a projection of more resistant rock(DEV) • Less resistant rock transported down-valley both subglacial and englacial (✓) • Subglacial debris causes abrasion to occur (✓) on the roche moutonnée causing striations (DEV) seen WSW on Fig. 2. (DEV) • On the down-valley side (to the east on Fig. 2), pressure is reduced and meltwater re-freezes (✓), resulting in plucking (DEV) creating a steeper, more rugged slope (DEV)		**Must have explicit reference to material for credit.**
2	**(d)***		**Discuss the relative importance of geomorphic processes in forming glacial landforms.** **AO1** **Level 3 (6-8 marks)** Demonstrates **comprehensive** knowledge and understanding of geomorphic processes in forming glacial landforms. The answer should include **accurate place-specific** detail. **Level 2 (3-5 marks)** Demonstrates **thorough** knowledge and understanding of geomorphic processes in forming glacial landforms. The answer should include **place-specific** detail which is **partially accurate**. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of geomorphic processes in forming glacial landforms.	**16** **AO1 x8** **AO2 x8**	**Indicative content** **AO1 – 8 marks** Knowledge and understanding of geomorphic processes in forming glacial landforms could potentially include: • Weathering – physical, chemical, biological • Mass movement – rockfall, slides • Glacial processes – erosion, nivation, transportation, deposition **AO2 – 8 marks** Apply knowledge and understanding to analyse and evaluate the relative importance of geomorphic processes and other factors in forming glacial landforms could potentially include: • Importance will vary depending on use of case study or landforms

			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 **comprehensive** application of knowledge and understanding to provide clear and developed analysis that shows accuracy to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions and evidence, of the relative importance of geomorphic processes in forming glacial landforms. **Level 2 (3-5 marks)** Demonstrates **thorough** application of knowledge and understanding to provide sound analysis that shows some accuracy to provide a sound evaluation that offers generalised judgements and conclusions, with limited use of evidence, of the relative importance of geomorphic processes in forming glacial landforms. **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 relative importance of geomorphic processes in forming glacial landforms. **0 marks** No response or no response worthy of credit. **Quality of extended response** **Level 3**		• Importance of current climatic conditions e.g. without temperatures fluctuating around freezing mechanical weathering processes e.g. freeze thaw cannot take place and are limited, or cold enough for glaciers to form and advance • Importance of post-glacial climate change e.g. steadily rising temperatures with many fluctuations create outwash deposition resulting in delta kames, eskers and outwash plains • Importance of climate change creating periglacial landforms e.g. patterned ground, pingos • Importance of human activity both deliberate and unintentional e.g. urban heat island effect causing increased melting and increased solifluction, thermokarst extends and develops

			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)		**With reference to a <u>CASE STUDY</u> of <u>ONE</u> dryland landscape that is being used by people, explain the reasons for the economic activity taking place.** **Level 3 (6-8 marks)** Demonstrate **thorough** knowledge and understanding of the reasons for economic activity in <u>ONE</u> dryland landscape (AO1). This will be shown by including **well-developed** ideas with a **clear** appreciation of the reasons for economic activity in <u>ONE</u> dryland landscape. **Level 2 (3-5 marks)** Demonstrate **reasonable** knowledge and understanding of the reasons for economic activity in <u>ONE</u> dryland landscape (AO1). This will be shown by including **developed** ideas with **some** appreciation of the reasons for economic activity in <u>ONE</u> dryland landscape. **Level 1 (1-2 marks)** Demonstrate **basic** knowledge and understanding of the reasons for economic activity in <u>ONE</u> dryland landscape (AO1). This will be shown by including **simple** ideas with **no** or **limited** appreciation of the reasons for economic activity in <u>ONE</u> dryland landscape. **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 economic activity in <u>ONE</u> dryland landscape could potentially include: • reasons will vary across different dryland landscape systems and different human activities • will likely refer to economic development studied in the context of it causing intentional or unintentional change • water availability for irrigation for agriculture e.g. exogenic river, oases • water availability for water supply to settlements e.g. aquifer, dam construction • resource exploitation for economic growth e.g. minerals, solar energy • development of tourism e.g. attractions of landscape and landforms, climate, wildlife, culture Candidates can achieve L3 for one type of economic activity.

3	**(b)**	**(i)**	**Study TABLE 3, which shows average monthly precipitation for a dryland location in Australia for 11 months during 2019. Using the data in TABLE 3, calculate the median. You must show your working.** Order values from lowest to highest (or vice versa) 1, 8, 8, 9, 10, 15, 18, 30, 30, 35, 45 (✓) Median value is the 6th value = 15 (✓)	**2** **AO3 x2**	**AO3 – 2 marks** 1 x 1 mark for correct working (✓) 1 x 1 mark for correct answer (✓)
3	**(b)**	**(ii)**	**Using the data in TABLE 3, calculate the inter-quartile range. You must show your working.** IQR= 30mm (UQ) – 8mm (LQ) (✓) = 22mm (✓)	**2** **AO3 x2**	**AO3 – 2 marks** 1 x 1 mark for correct working (✓) 1 x 1 mark for correct answer (✓) Units not required If 3bi working is incorrect, allow IQR calculation based on their working shown in 3bi
3	**(b)**	**(iii)**	**The average monthly precipitation for December in 2019 was 40mm. Interpret this value with reference to the interquartile range for TABLE 3.** • The value 40mm, falls outside the dispersion of 50%/the majority of the values of the dataset (✓), it is an anomaly/extreme value (DEV)	**2** **AO3 x2**	**AO3 – 2 marks** 1 x 1 mark (✓) 1 x 1 mark (DEV) • instate the relationship of the value to the interquartile range (✓) • Interpretation of value as anomaly / extreme (DEV)
3	**(c)**		**Study FIG. 3, a dryland landscape in the USA. With reference to FIG. 3, explain ONE way flows of material influence the formation of landform C.**	**3** **AO2 x3**	1 x (✓), 2 x (DEV) for analysing FIG. 3 to explain ONE way flows of material influence the formation of landform C (the canyon).

			• Vertical erosion (✓) caused by abrasion (DEV) during pluvial conditions as rivers carried coarse load along the river bed (DEV) • Aeolian erosion (✓) of canyon sides cause further erosion very slowly over time (DEV) • Talus slopes (✓) can be seen on Fig. 3 caused by mechanical weathering (DEV) and subsequent mass movement (DEV) lowering the angle of the canyon side at the base of the canyon		**Must have explicit reference to material for credit.**
3	(d)*		**Discuss the relative importance of geomorphic processes in forming dryland landforms.** **AO1** **Level 3 (6-8 marks)** Demonstrates **comprehensive** knowledge and understanding of geomorphic processes in forming dryland landforms. The answer should include **accurate place-specific** detail. **Level 2 (3-5 marks)** Demonstrates **thorough** knowledge and understanding of geomorphic processes in forming dryland landforms. The answer should include **place-specific** detail which is **partially accurate**. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of geomorphic processes in forming dryland landforms. There is an attempt to include **place-specific** detail but it is **inaccurate**.	**16** **AO1 x8** **AO2 x8**	**Indicative content** **AO1 – 8 marks** Knowledge and understanding of geomorphic processes in forming dryland landforms could potentially include: • Weathering – physical, chemical, biological • Mass movement – debris flows, talus slopes • Fluvial processes – surface wash, river erosion, transportation • Aeolian processes – erosion, transportation, deposition **AO2 – 8 marks** Apply knowledge and understanding to analyse and evaluate the relative importance of geomorphic processes and other factors in forming dryland landforms could potentially include: • Importance will vary depending on use of case study or landforms

			0 marks No response or no response worthy of credit. **AO2** **Level 3 (6-8 marks)** Demonstrates **comprehensive** application of knowledge and understanding to provide clear and developed analysis that shows accuracy to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions and evidence, of the relative importance of geomorphic processes and other factors in forming dryland landforms. **Level 2 (3-5 marks)** Demonstrates **thorough** application of knowledge and understanding to provide sound analysis that shows some accuracy to provide a sound evaluation that offers generalised judgements and conclusions, with limited use of evidence, of the relative importance of geomorphic processes and other factors in forming dryland landforms. **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 relative importance of geomorphic processes and other factors in forming dryland landforms. **0 marks** No response or no response worthy of credit. **Quality of extended response** **Level 3**		• Importance of current climatic conditions e.g. without limited precipitation arid conditions would not exist • Importance of earlier pluvial periods creating wadis and playas • Importance of colder climatic conditions creating landforms e.g. talus slopes, rock glaciers, ognips, pingos and ice wedges • Importance of human activity both deliberate and unintentional e.g. exacerbating or reducing the intensity of water supply issues, tourism degrading landscape and reducing soil stability and increasing soil erosion

			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 <u>FIG. 4</u>, which shows spring snowmelt timing in Alaska 1999-2015. Using evidence from Fig. 4, identify THREE limitations of the data presentation method.** • Lack of information about the variation of snow melt timings over the years (✓) • Lack of information of source or use – possible bias (✓) • Lack of locational data within Alaska to help identify patterns (✓) • The colours represent different periods of time – one is for 20 days and another for 10 (✓) • Sharp boundaries between colours whereas ice wouldn't melt like this (✓) • Date range covered by some colours is quite large (20 days) so you don't know when exactly the ice melted (✓)	**3** **AO3 x3**	**AO3 – 1 marks** 3 x 1 (✓) for identification of limitations of this data presentation technique • Allow any appropriate limitation
4	**(a)**	**(ii)**	**With reference to <u>FIG. 4</u>, suggest <u>ONE</u> way this seasonal change affects the water cycle in the Arctic tundra.** • Snowmelt forms many pool and shallow lakes (✓) because drainage is poor and water cannot infiltrate the soil as there is still permafrost at depth (DEV) • Some evapotranspiration will occur as temperatures are higher and snow has melted (✓) however humidity remains low, as rates are minimal due to low temperatures (DEV) • Snowmelt results in more evaporation (✓) as more water is in rivers (DEV)	**2** **AO2 x2**	**AO2 – 2 marks** 1 x 1 (✓) for interpretation of the diagram to suggest <u>ONE</u> way this seasonal change affects the water cycle in the Arctic tundra 1 x 1 (DEV) for link to the water cycle

4	**(a)**	**(iii)**	**With reference to <u>FIG. 4</u>, suggest <u>ONE</u> way this seasonal change affects the carbon cycle in the Arctic tundra.** • Waterlogging of the soil and low temperatures (✓) slow decomposition and respiration and the flow of CO2 into the atmosphere (DEV) • Snowmelt provides water for plant growth along with higher temperatures (✓), although photosynthesis and NPP are low with short growing season and low temperatures (DEV) • Snowmelt exposes the active layer (✓) so this melts and releases carbon to the atmosphere (DEV)	**2** **AO2 x2**	**AO2 – 2 marks** 1 x 1 (✓) for interpretation of the diagram to suggest <u>ONE</u> way this seasonal change affects the carbon cycle in the Arctic tundra. 1 x 1 (DEV) for link to carbon cycle
4	**(b)**		**Examine how temperature affects flows and stores in the carbon cycle of a tropical rainforest.** **Level 3 (7-10 marks)** Demonstrates **comprehensive** knowledge and understanding of temperature and the carbon cycle (AO1). Demonstrates **thorough** application of knowledge and understanding to provide a detailed evaluation of the influence of temperature on the carbon cycle (AO2). This will be shown by including **well-developed** ideas of the influence of temperature on flows and stores of the carbon cycle of a tropical rainforest. **Level 2 (4-6 marks)** Demonstrates **thorough** knowledge and understanding of temperature and the carbon cycle (AO1).	**10** **AO1 6** **AO2 4**	**Indicative content** **AO1 – 6 marks** Knowledge and understanding of flows and stores in the carbon cycle of a tropical rainforest could potentially include: • Flows in the carbon cycle of a tropical rainforest o Precipitation, photosynthesis, decomposition, combustion, weathering • stores in the carbon cycle of a tropical rainforest o vegetation, soil, organic matter within soil o atmosphere, lithosphere, hydrosphere **AO2 – 4 marks** Apply knowledge and understanding to provide a detailed evaluation of the influence of temperature on flows and stores in the carbon cycle of a tropical rainforest could potentially include: • High temperatures, high convectional rainfall and intense insolation lead to high primary production (NPP ~2500 grams/m^2/yr) • Amazonia accounts for 15-25% of global NPP in terrestrial ecosystems – this could be argued

			Demonstrates **reasonable** application of knowledge and understanding to provide a detailed evaluation of the influence of temperature on the carbon cycle (AO2). This will be shown by including **developed** ideas of the influence of temperature on flows and stores of the carbon cycle of a tropical rainforest. **Level 1 (1–3 marks)** Demonstrates **basic** knowledge and understanding of temperature and the carbon cycle (AO1). Demonstrates **basic** application of knowledge and understanding to provide an evaluation of the influence of temperature on the carbon cycle (AO2). This will be shown by including **some** ideas about the influence of temperature on flows and stores of the carbon cycle of a tropical rainforest. **0 marks** No response or no response worthy of credit.		primarily because of the driving force of consistent high temperatures • High temperatures (between 25-30°C) and humid conditions (due to the almost daily intense precipitation) encourage rapid decomposition of organic litter by soil organisms (e.g. fungi and bacteria) releasing further carbon into the atmosphere • This encourages rapid rates of nutrient release and take up into the tree root system • convectional rainfall creating heavily leeched soils leads to increase carbon in rivers and lakes • Chemical weathering of rock is intense due to the high temperatures creating a soil mantle of up to 100m in the Amazon releasing carbon from the bedrock
4	(c)		**To what extent do human factors enhance rather than disturb the natural processes and stores in the water cycle?** **AO1** **Level 3 (6–8 marks)** Demonstrates **thorough** knowledge and understanding of human factors and natural processes and stores in the water cycle. The answer should include **accurate place-specific detail**. **Level 2 (3–5 marks)**	**16** **AO1 8** **AO2 8**	**Indicative content** **AO1 – 8 marks** Knowledge and understanding of human factors and natural processes and stores in the water cycle could potentially include: • Human factors o Land use changes e.g. farming or forestry or growth in urban areas o Water extraction e.g. surface extraction, sub-surface groundwater extraction • Water cycle o Processes e.g. evaporation, transpiration, condensation, precipitation, interception, ablation, run-off, catchment hydrology,

			Demonstrates **reasonable** knowledge and understanding of human factors and natural processes and stores in the 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 human factors and natural processes and stores in the water cycle. There is an attempt to include **place-specific detail but it is inaccurate.** **0 marks** No response or no response worthy of credit.		percolation, throughflow, groundwater flow, cryospheric processes o Stores e.g. atmosphere, oceans, water bodies, ice, soil, vegetation and groundwater o Positive and negative feedback loops within the water cycle
			AO2 **Level 3 (6-8 marks)** Application of knowledge and understanding is **thorough**. Analysis is clear, developed and convincing. Evaluation of the impacts of human factors on the water cycle is detailed and substantiated. Judgements are secure and evidence based leading to rational conclusions. **Level 2 (3-5 marks)** Application of knowledge and understanding is **reasonable**. Analysis is sound with some development that is mostly relevant. Evaluation of the impacts of human factors on the water cycle is sound but partial. Judgements are generalised with some use of evidence leading to appropriate conclusions. **Level 1 (1-2 marks)**		**AO2 – 8 marks** Apply knowledge and understanding to analyse and evaluate the impacts of human factors on the water cycle could potentially include: • Expect a range of evaluation based on examples – candidates may compare over temporal or spatial scales • Urbanisation disturbs the water cycle as artificial surfaces allow little or no infiltration which drastically reduces groundwater stores. Furthermore, precipitation can lead to rapid overland flow and flooding • Farming changes interception by vegetation often reducing it severely, which also affects rates of evaporation and transpiration. Different stages of farming have different effects e.g. ploughing leads to greater infiltration but surface run off increases after machinery has compacted the soil

			Application of knowledge and understanding is **basic**. Analysis is simple with little or no development. Evaluation of the impacts of human factors on the water cycle is weak or absent. Judgements, if present, are unsupported leading to simple conclusions. **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.		• Forestry can enhance natural processes as rates of interception, evaporation and transpiration are increased and run-off can be decreased • Water extraction disturbs the water cycle by dramatically reducing channel stores and groundwater storage

Assessment Objectives (AO) grid

Candidates answer **one** of questions 1 to 3, **and** question 4. This has been considered in the totals indicated below.

Question	AO1	AO2	AO3	Marks
1a	8	0	0	8
1bi	0	0	2	2
1bii	0	0	2	2
1biii	0	2	0	2
1c	0	3	0	3
1d*	8	8	0	16
2a	8	0	0	8
2bi	0	0	2	2
2bii	0	0	2	2
2biii	0	2	0	2
2c	0	3	0	3
2d*	8	8	0	16
3a	8	0	0	8
3bi	0	0	2	2
3bii	0	0	2	2
3biii	0	2	0	2
3c	0	3	0	3
3d*	8	8	0	16
4ai	0	0	3	3
4aii	0	2	0	2
4aiii	0	2	0	2
4b	6	4	0	10
4c*	8	8	0	16
Total	16	27	9	66

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