GCE

Geography

H481/01: Physical systems

A Level

Mark Scheme for June 2022

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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
SCORIS

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *scoris 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 scoris 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 scoris 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 scoris 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 scoris **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 scoris 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: Not applicable in F501
    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
SEEN	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.

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.

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, with some link between rational conclusions and evidence.	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
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.	The 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/an: 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 how coastal landscapes can be viewed as systems.** **Level 3 (6-8 marks)** Demonstrate **thorough** knowledge and understanding of how coastal landscapes can be viewed as systems (AO1). This will be shown by including **well-developed** ideas with a **clear** appreciation of coastal landscapes as systems. **Level 2 (3-5 marks)** Demonstrate **reasonable** knowledge and understanding of how coastal landscapes can be viewed as systems (AO1). This will be shown by including **developed** ideas with **some** appreciation of coastal landscapes as systems. **Level 1 (1-2 marks)** Demonstrate **basic** knowledge and understanding of how coastal landscapes can be viewed as systems (AO1). This will be shown by including **simple** ideas with **no** or **limited** appreciation of coastal landscapes as systems. **0 marks** No response or no response worthy of credit.	**8** **AO1 x8**	**Indicative content:** **AO1 – 8 marks** Knowledge and understanding of how coastal landscapes can be viewed as systems could potentially include: • open system (sediment cells as closed systems) • inputs of energy (kinetic, thermal and potential) as well as sediment from marine deposition, fluvial sources, weathering and mass movement • processes (flows, transfers, throughputs) e.g. longshore drift, weathering, erosion, mass movement • stores e.g. beach, nearshore sediment accumulations • outputs e.g. marine and wind erosion, evaporation • can exist in state of equilibrium (material entering the system is equal to the sediment removed), or can be disturbed causing a dynamic equilibrium as the system responds to the disturbance – negative feedback
1	(b)	(i)	**Study Fig. 1. Comment on one advantage of this data presentation technique.**	**2** **AO3 x2**	**AO3 – 2 marks** 1 x 1 mark (✓) 1 x 1 mark (DEV)

			• Clearly shows if there is a relationship between the variables (✓) and determines if further tests of correlation can be carried out (DEV) • Easy to identify anomalies (✓) so that these can be explained or examined further (DEV) • Easy and quick to draw (✓) so many people are able to complete this technique (DEV) • Shows the trend clearly (✓) so you can see quickly that spending has increased (DEV) • You can compare the year-on-year spending (✓) and see changes over time (DEV) • You can see the trend easily (✓) because it is clear and easy to read/understand (DEV)		
1	**(b)**	**(ii)**	**Describe the relationship shown.** • Positive correlation (✓) • Accept any use of data as evidence e.g., increased from £460 million to £750 million in 20 years (✓) • Strong relationship (✓) • Variation over time e.g., more varied in middle of period (✓) • Anomalies exist e.g., 2012 low (✓) • Strong (✓) positive correlation (✓)	**2** **AO3 x2**	**AO3 – 2 marks** 1 x 1 mark (✓) for identifying relationship direction and then a further mark (✓) for use of data, describing strength, noting variation over time or identifying an anomaly. Accept 'positive' Accept the idea that as the years go by, coastal spending increases Please note only 1 (✓) mark for identifying the relationship –e.g., stating that there is a positive correlation and that spending increases with years would be 1 mark only.
1	**(b)**	**(iii)**	**Study Fig. 2, which shows a correlation coefficient calculated for the data in Fig. 1 and a table of critical values for a significance test.** **With reference to Fig. 2, test the significance of this relationship.**	**3** **AO2 x1** **AO3 x2**	**AO2 – 1 mark** 1 x 1 (✓) for interpretation of the results shown in Fig. 2 to correctly state graph is statistically significant (✓) **or** that there is a 99% chance that the results did not occur by chance (✓) **or** reject the null hypothesis (✓). **AO3 – 2 marks**

			• N = 20 (✓), 0.92 is higher than 0.45 and 0.591 (✓) and so the relationship is statistically significant (✓) • N- 2 = 18 (✓), 0.92 is higher than 0.475 (✓) and so we can reject the null hypotheses (✓) • The critical value is 0.45 (✓), the result is higher than this (✓) so the relationship is not due to chance (✓)		2 x 1 (✓) for n is 20 or n-2 is 18 **or** quoting the corresponding critical values for these (✓) for stating the value is higher than the critical value
1	**(b)**	**(iv)**	**Suggest one reason for this relationship.** • Materials or transport may have increased in price over time (✓) so further spending is required to continue the same level of protection (DEV) • More frequent/greater intensity storm events (✓) causing more erosion (DEV) • Increased development of the coastline (✓) so more money is spent to protect these areas due to their value (DEV) • Increased population density (✓) so there are more homes that need protecting (DEV) • Sea levels rising (✓) so high energy waves/increased erosion (DEV)	**2** **AO2 x2**	**AO2 – 2 marks** 1 x 1 mark (✓) 1 x 1 mark (DEV) Climate change alone is not accepted for the first mark.
1	**(c)**		**To what extent are long term changes more influential on coastal landscape systems than short term changes?** **AO1** **Level 3 (6-8 marks)** Demonstrates **comprehensive** knowledge and understanding of how long term and short-term changes influence coastal landscape systems.	**16** **AO1 x8** **AO2 x8**	**Indicative content** **AO1 – 8 marks** Knowledge and understanding of how long term and short-term changes influence coastal landscape system could potentially include: • Long term changes e.g., changes over millennia e.g., shore platform development in erosional landscapes, or spit or tombolo development in depositional landscapes. Long term changes may also include climate change

			The answer should include **accurate place-specific** detail. **Level 2 (3-5 marks)** Demonstrates **thorough** knowledge and understanding of how long term and short-term changes influence 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 how long term and short-term changes influence coastal 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)** 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 long term against short term changes in coastal landscape systems. **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		• Short term changes e.g., over seconds e.g., arch collapse, mass movement events in erosional landscapes or breaching of onshore bars in depositional landscapes, as well as human changes/management **AO2 – 8 marks** Apply knowledge and understanding to analyse and evaluate the relative influence of long term against short term changes within coastal landscape systems could potentially include: • Expect use of case studies of erosional and or depositional landscapes to exemplify argument • Influence on coastal landscape may be evaluated environmentally e.g., creation of landforms or spatially or temporally or socially or economically • E.g., In erosive coastal landscapes, short term changes creating arches, stacks or stumps are very influential in changing the unique nature of the coastline e.g., Flamborough Head, Yorkshire. However, long term changes e.g., creating shore cut platforms at Robin Hood's Bay which can be extensive but are also limited to low tide so less influential to the system • E.g., Environmentally both long term and short-term changes create new landforms and input sediment into the littoral cell, however long-term changes because of their lengthy period of input are likely to be more influential in accumulation in terms of influence in the littoral cell • Short term changes have a smaller spatial scale e.g., arch collapse or spit breach compared to

			limited use of evidence, of the relative importance of long term against short term changes in coastal landscape systems. **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 long term against short term changes in coastal landscape systems. **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.		long term changes e.g., shore platform creation which can span almost 11km around Flamborough Head, Yorkshire • Temporal scales are more significant with long term changes as occur over several millennia, whereas short term changes occur in minutes

Question			Answer	Mark	Guidance
2	(a)		**Explain how glaciated landscapes can be viewed as systems.** **Level 3 (6-8 marks)** Demonstrate **thorough** knowledge and understanding of how glaciated landscapes can be viewed as systems (AO1). This will be shown by including **well-developed** ideas with a **clear** appreciation of glaciated landscapes as systems. **Level 2 (3-5 marks)** Demonstrate **reasonable** knowledge and understanding of how glaciated landscapes can be viewed as systems (AO1). This will be shown by including **developed** ideas with **some** appreciation of glaciated landscapes as systems. **Level 1 (1-2 marks)** Demonstrate **basic** knowledge and understanding of how glaciated landscapes can be viewed as systems (AO1). This will be shown by including **simple** ideas with **no** or **limited** appreciation of glaciated landscapes as systems. **0 marks** No response or no response worthy of credit.	8 AO1 x8	**Indicative content:** **AO1 – 8 marks** Knowledge and understanding of how glaciated landscapes can be viewed as systems could potentially include: • open system • inputs of kinetic (wind and moving glaciers), thermal (sun) and potential energy (from material on slopes – deposition, weathering, mass movement, ice from accumulated snowfall) • processes (flows, transfers, throughputs) e.g., movement of ice, water and debris downslope under gravity, debris held within glacier, basal sliding of ice • stores e.g., ice, water, debris • outputs e.g., glacial and wind erosion from rock surfaces, evaporation, sublimation and meltwater • can exist in state of equilibrium (ice coming into the system is equal to the ice being lost), or can be disturbed causing a dynamic equilibrium as the system responds to the disturbance – negative feedback

2	(b)	(i)	**Study Fig. 3, which shows the relationship between spending on oil pipeline management and time in Alaska, USA.** **Comment on one advantage of this data presentation technique.** • Clearly shows if there is a relationship between the variables (✓) and determines if further tests of correlation can be carried out (DEV) • Easy to identify anomalies (✓) so that these can be explained or examined further (DEV) • Easy and quick to draw (✓) so many people are able to complete this technique (DEV) • Shows the trend clearly (✓) so you can see quickly that spending has increased (DEV) • You can compare the year-on-year spending (✓) and see changes over time (DEV) • You can see the trend easily (✓) because it is clear and easy to read/understand (DEV)	**2** **AO3 x2**	**AO3 – 2 marks** 1 x 1 mark (✓) 1 x 1 mark (DEV)
2	(b)	(ii)	**Describe the relationship shown.** • Positive correlation (✓) • Accept any use of data to evidence claim e.g., increased from £180 million to £550 million in 20 years (✓) • Strong relationship (✓) • Some variation over time e.g., decrease in recent years (✓) • Anomalies exist e.g., 2014 high (✓)	**2** **AO3 x2**	**AO3 – 2 marks** 1 x 1 mark (✓) for identifying relationship direction and then a further mark (✓) for use of data, describing strength, noting variation over time or identifying an anomaly. Accept 'positive' Accept the idea that as the years go by, management spending increases Please note only 1 (✓) mark for identifying the relationship –e.g., stating that there is a positive correlation and that spending increases with years would be 1 mark only.

2	**(b)**	**(iii)**	**Study Fig. 4, which shows a correlation coefficient calculated for the data in Fig. 3 and a table of critical values for a significance test.** **With reference to Fig. 4, test the significance of this relationship.** • N = 20 (✓), 0.83 is higher than 0.45 and 0.591 (✓) and so the relationship is statistically significant (✓) • N- 2 = 18 (✓), 0.83 is higher than 0.475 (✓) and so we can reject the null hypotheses (✓) • The critical value is 0.45 (✓), the result is higher than this (✓) so the relationship is not due to chance (✓)	**3** **AO2 x1** **AO3 x2**	**AO2 – 1 mark** 1 x 1 (✓) for interpretation of the results shown in Fig. 2 to correctly state graph is statistically significant (✓) **or** that there is a 99% chance that the results did not occur by chance (✓) **or** reject the null hypothesis (✓). **AO3 – 2 marks** 2 x 1 (✓) for n is 20 or n-2 is 18 **or** quoting the corresponding critical values for these (✓) for stating the value is higher than the critical value
2	**(b)**	**(iv)**	**Suggest one reason for this relationship.** • Materials or transport may have increased in price over time (✓) therefore it is more expensive to maintain the pipeline (DEV) • Increased demand for materials (✓) so the use of the pipeline increases and more maintenance is required (DEV) • Warming temperatures leading to increased melting of the permafrost (✓) and therefore increased need for maintenance as the foundations might be affected (DEV)	**2** **AO2 x2**	**AO2 – 2 marks** 1 x 1 mark (✓) 1 x 1 mark (DEV)
2	**(c)***		**To what extent are long term changes more influential on glaciated landscape systems than short term changes?** **AO1** **Level 3 (6-8 marks)**	**16** **AO1 x8** **AO2 x8**	**Indicative content** **AO1 – 8 marks** Knowledge and understanding of how long term and short-term changes influence glaciated landscape system could potentially include:

			Demonstrates **comprehensive** knowledge and understanding of how long term and short-term changes influence glaciated landscape systems. The answer should include **accurate place-specific** detail. **Level 2 (3-5 marks)** Demonstrates **thorough** knowledge and understanding of how long term and short-term changes influence glaciated landscape systems. The answer should include **place-specific** detail which is **partially accurate**. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of how long term and short-term changes influence glaciated 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)** 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 long term against short term changes in glaciated landscape systems. **Level 2 (3-5 marks)**		• Long term changes e.g., over millennia e.g., erosion of glacial troughs in valley glacier systems or erosion of basins in ice sheet systems. Long term changes may also include climate change • Short term changes e.g., over seconds e.g., rockfalls adding debris to a valley glacier or weathering adding debris to an ice sheet, or volcanic activity leading to rapid melting, as well as human changes/management **AO2 – 8 marks** Apply knowledge and understanding to analyse and evaluate the relative influence of long term against short term changes within glaciated landscape systems could potentially include: • Expect use of case studies of a valley glacier and or an ice sheet to exemplify argument • Influence on glaciated landscape may be evaluated environmentally e.g., creation of landforms or measured by interrelations with other landforms or temporally or spatially or socially or economically • Long term changes create more stunning landscapes e.g., glacial troughs, hanging valleys, arêtes, than small rock face changes from weathering debris falling or slopes being created • Without short term changes, long term changes would not be so effective as there would be less material in the glacier so abrasion rates would be lower

			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 long term against short term changes in glaciated landscape systems. **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 long term against short term changes in glaciated landscape systems. **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.		• Short term changes have a smaller spatial scale e.g., rockfall compared to long term changes e.g., glacial trough creation which can span many kilometres in length and up to several kilometres in width • Temporal scales are more significant with long term changes as occur over several millennia, whereas short term changes occur in minutes

Question			Answer	Mark	Guidance
3	(a)		**Explain how dryland landscapes can be viewed as systems.** **Level 3 (6-8 marks)** Demonstrate **thorough** knowledge and understanding of how dryland landscapes can be viewed as systems (AO1). This will be shown by including **well-developed** ideas with a **clear** appreciation of dryland landscapes as systems. **Level 2 (3-5 marks)** Demonstrate **reasonable** knowledge and understanding of how dryland landscapes can be viewed as systems (AO1). This will be shown by including **developed** ideas with **some** appreciation of dryland landscapes as systems. **Level 1 (1-2 marks)** Demonstrate **basic** knowledge and understanding of how dryland landscapes can be viewed as systems (AO1). This will be shown by including **simple** ideas with **no** or **limited** appreciation of dryland landscapes as systems. **0 marks** No response or no response worthy of credit.	**8** **AO1 x8**	**Indicative content:** **AO1 – 8 marks** Knowledge and understanding of how dryland landscapes can be viewed as systems could potentially include: • open system • inputs of energy (kinetic, thermal and potential), material from aeolian deposition, weathering, mass movement, precipitation • processes (flows, transfers, throughputs) e.g., weathering, erosion, mass movement, transportation by aeolian and fluvial processes • stores e.g., landforms e.g., depositional; dunes, screes, alluvial fans, playas and erosional; inselbergs, pediments, canyons • outputs e.g., aeolian erosion, evapotranspiration, long wave radiation, stream flow • can exist in state of equilibrium (material into the system is equal to the sediment removed), or can be disturbed causing a dynamic equilibrium as the system responds to the disturbance – negative feedback
3	(b)	(i)	**Study Fig. 5, which shows the relationship between spending on water supply management and time in the USA.**	**2** **AO3 x2**	**AO3 – 2 marks** 1 x 1 mark (✓) 1 x 1 mark (DEV)

			Comment on one advantage of this data presentation technique. • Clearly shows if there is a relationship between the variables (✓) and determines if further tests of correlation can be carried out (DEV) • Easy to identify anomalies (✓) so that these can be explained or examined further (DEV) • Easy and quick to draw (✓) so many people are able to complete this technique (DEV) • Shows the trend clearly (✓) so you can see quickly that spending has increased (DEV) • You can compare the year-on-year spending (✓) and see changes over time (DEV) • You can see the trend easily (✓) because it is clear and easy to read/understand (DEV)		
3	**(b)**	**(ii)**	**Describe the relationship shown.** • Showing positive correlation (✓) • Use of data as evidence e.g., increased from £180 million to £1390 million in 20 years (✓) • Strong relationship (✓) • Some variation over time e.g., more rapid increase in recent years (✓) • Anomalies exist e.g., 2020 much higher (✓)	**2** **AO3 x2**	**AO3 – 2 marks** 1 x 1 mark (✓) for identifying relationship direction and then a further mark (✓) for use of data, describing strength, noting variation over time or identifying an anomaly. Accept 'positive' Accept the idea that as the years go by, spending on water management generally increases Please note only 1 (✓) mark for identifying the relationship –e.g., stating that there is a positive correlation and that spending increases with years would be 1 mark only.
3	**(b)**	**(iii)**	**Study Fig 6, which shows a correlation coefficient calculated for the data in Fig. 5 and a table of critical values for a significance test.**	**3** **AO2 x1** **AO3 x2**	**AO2 – 1 mark** 1 x 1 (✓) for interpretation of the results shown in Fig. 2 to correctly state graph is statistically significant (✓) **or**

			With reference to Fig. 6, test the significance of this relationship. • N = 20 (✓), 0.94 is higher than 0.45 and 0.591 (✓) and so the relationship is statistically significant (✓) • N- 2 = 18 (✓), 0.94 is higher than 0.475 (✓) and so we can reject the null hypotheses (✓) • The critical value is 0.45 (✓), the result is higher than this (✓) so the relationship is not due to chance (✓)		that there is a 99% chance that the results did not occur by chance (✓) **or** reject the null hypothesis (✓). **AO3 – 2 marks** 2 x 1 (✓) for n is 20 or n-2 is 18 **or** quoting the corresponding critical values for these (✓) for stating the value is higher than the critical value
3	**(b)**	**(iv)**	**Suggest one reason for this relationship.** • Materials or transport may have increased in price over time (✓) so it costs more to manage water supply (DEV) • More frequent drought (✓) necessitating the need for greater infrastructure to supply water (DEV) • Increase in population (✓) so further demands made on water supply (DEV) • Over time the supply system and infrastructure will deteriorate (✓) so increased maintenance is required (DEV)	**2** **AO2 x2**	**AO2 – 2 marks** 1 x 1 mark (✓) 1 x 1 mark (DEV)
3	**(c)***		**To what extent are long term changes more influential on dryland landscape systems than short term changes?** **AO1** **Level 3 (6-8 marks)** Demonstrates **comprehensive** knowledge and understanding of how long term and short-term changes influence dryland landscape systems.	**16** **AO1 x8** **AO2 x8**	**Indicative content** **AO1 – 8 marks** Knowledge and understanding of how long term and short-term changes influence dryland landscape system could potentially include: • Long term changes e.g., over millennia e.g., pediment development or deep chemical

			The answer should include **accurate place-specific** detail. **Level 2 (3-5 marks)** Demonstrates **thorough** knowledge and understanding of how long term and short-term changes influence 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 how long term and short-term changes influence 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)** 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 long term against short term changes in dryland landscape systems. **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		weathering. Long term changes may also include climate change • Short term changes e.g., over seconds e.g., flash floods eroding wadis or depositing alluvial fans in mid-latitude deserts, or surface wash in a low-latitude desert after a flash flood, as well as human changes/management **AO2 – 8 marks** Apply knowledge and understanding to analyse and evaluate the relative influence of long term against short term changes within dryland landscape systems could potentially include: • Expect use of case studies of a mid-latitude and or low-latitude desert to exemplify argument • Influence on dryland landscape may be evaluated environmentally e.g., creation of landforms, or measured by interrelations with other landforms or spatially or temporally, or socially or economically • Long term changes much more influential carving out the landscape, forming imposing mountains and plains in deserts e.g., inselbergs and pediments creating a more dramatic landscape • Role of long-term chemical weathering significant in producing material for aeolian transportation and erosion which significantly influences landscape • Short term change of mass movement down windward slope of sand dunes is influential but it the long-term accumulation of many short-term changes that causes the dunes to migrate

			offers generalised judgements and conclusions, with limited use of evidence, of the relative importance of long term against short term changes in dryland landscape systems. **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 long term against short term changes in dryland landscape systems. **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.		across the desert – a significant change to the landscape • Short term changes have a smaller spatial scale e.g., flash flood compared to long term changes e.g., pediment and inselberg creation which can span a much larger area • Temporal scales are more significant with long term changes as occur over several millennia, whereas short term changes occur in minutes

Question			Answer	Mark	Guidance
4	(a)	(i)	**Study Fig. 7, OS Map of Wiston Park, UK.** **Comment on one advantage of this data presentation technique.** • Shows scale (✓) so you can determine the spatial area of different features (DEV) • Shows the relief (✓) due to the contour lines/spot heights (DEV) • There is a key present (✓) so you can understand what is in the surrounding area (DEV)	**2** **AO3 x2**	**AO3 – 2 marks** 1 x (✓) for the advantage 1 x DEV for development of the advantage Development could be further explanation of the feature or how it would allow you to understand/interpret the area.
4	(a)	(ii)	**State the distance in kilometres, between 145124 and 155124.** 1 km (✓) Accept range 0.9-1.1km	**1** **AO3 x 1**	**AO3 – 1 mark** 1 x 1 mark (✓) for accurately measuring the distance between 145124 (parking) and 155124 (place of worship with a tower). Units not required.
4	(a)	(iii)	**Suggest <u>two</u> reasons for differences in characteristics of the water cycle between Area A and Area B.** • Greater tree cover in A which means more interception (✓) and therefore there is also greater transpiration (DEV) • Area A has steeper relief so run off is greater (✓) where as in area B there may be greater levels of infiltration (DEV) • Non-coniferous woodland in A causes greater rates of interception (✓) and infiltration (DEV) which leads to greater throughflow (DEV) • Area B may be farmland and so soil could be compacted (✓) which could mean less infiltration (DEV) and increase surface run off (DEV)	**4** **AO2 x4**	**AO2 – 4 marks** **Either** **1** (✓) for application of knowledge to explain difference in characteristics of the water cycle and 1 DEV for further development of point **Or** **1** (✓) and 2 x DEV The answer must include 2 different reasons for 4 marks (forest density and type of vegetation are acceptable as 2 different reasons). Please note do not accept there is no vegetation in area B.

			• Area B has a reservoir so greater stores of water (✓) which could lead to greater levels of evaporation (DEV)		
4	**(b)**		**Examine the extent to which the developing oil and gas industry affects the water cycle in the Arctic tundra.** **Level 3 (7-10 marks)** Demonstrates **comprehensive** knowledge and understanding of the oil and gas industry and the water cycle in the Arctic tundra (AO1). Demonstrates **thorough** application of knowledge and understanding to provide a detailed evaluation of the affect the oil and gas industry has on the water cycle in the Arctic tundra (AO2). This will be shown by including **well-developed** ideas of the affect the oil and gas industry has on the water cycle in the Arctic Tundra. **Level 2 (4-6 marks)** Demonstrates **thorough** knowledge and understanding of the oil and gas industry and the water cycle in the Arctic tundra (AO1). Demonstrates **reasonable** application of knowledge and understanding to provide a detailed evaluation of the affect the oil and gas industry has on the water cycle in the Arctic tundra (AO2). This will be shown by including **developed** ideas of the affect the oil and gas industry has on the water cycle in the Arctic Tundra. **Level 1 (1–3 marks)**	**10** **AO1 6** **AO2 4**	**Indicative content** **AO1 – 6 marks** Knowledge and understanding of developing oil and gas industry and the water cycle in the Arctic tundra could potentially include: • Developing oil and gas industry o Expect case study detail e.g., North Slope, Alaska discovered 1968 o Harsh environment; extreme cold and long periods of darkness, remote with poor access were challenges o Production went ahead due to high energy costs in USA and policy to reduce dependence on imports of oil o In early 1990s North Slope produced nearly 25% domestic production, recently this has dropped to 6% • Water cycle in the Arctic tundra o Average temperatures below freezing so water stored in permafrost. In summer the active layer melts creating meltwater pools. o Low levels of infiltration (blocked by permafrost) o Winter evapotranspiration is blocked by sub-zero temperatures, in summer some occurs from standing water o Humidity low, precipitation low **AO2 – 4 marks** Apply knowledge and understanding to provide a detailed evaluation of the affect the oil and gas industry has on the water cycle in the Arctic tundra could potentially include:

			Demonstrates **basic** knowledge and understanding of the oil and gas industry and the water cycle in the Arctic tundra (AO1). Demonstrates **basic** application of knowledge and understanding to provide an evaluation of the affect the oil and gas industry has on the water cycle in the Arctic tundra (AO2). This will be shown by including **some** ideas about the affect the oil and gas industry has on the water cycle in the Arctic Tundra. **0 marks** No response or no response worthy of credit.		• Activities (e.g., construction, dust deposition and vegetation removal) caused lowering of albedo/localised melting of the permafrost layer increases surface run-off and river discharge increasing flooding • In summer wetlands, ponds and lakes increasing in extent increasing rates of evaporation. Removal of vegetation reduces transpiration. • Strip mining creates artificial lakes disrupting drainage and leads to further melting • Localised surface run-off is reduced as water is abstracted for use in industry and building of ice roads • Management may have reduced the impact on the water cycle
4	**(c)**		**Assess the importance of carbon to humans.** **AO1** **Level 3 (6–8 marks)** Demonstrates **comprehensive** knowledge and understanding of the importance of carbon to humans. The answer should include **accurate place-specific detail**. **Level 2 (3–5 marks)** Demonstrates **thorough** knowledge and understanding of the importance of carbon to humans. The answer should include **some place-specific detail which is partially accurate**. **Level 1 (1–2 marks)** Demonstrates **basic** knowledge and understanding of the importance of carbon to humans.	**16** **AO1 8** **AO2 8**	**Indicative content** **AO1 – 8 marks** Knowledge and understanding of the importance of carbon could potentially include: • Ubiquitous from atmosphere, to sea bed sediments to all forms of flora and fauna • Estimated to form 95% of all known compounds • Provides 80% of global energy through fossil fuels, foundation of nearly all human activities • Wide use of carbon as a raw material e.g., in oil, or through timber as well as agricultural products • Natural greenhouse effect/regulator of climate • Use in photosynthesis **AO2 – 8 marks** Apply knowledge and understanding to analyse and evaluate the importance of carbon could potentially include: • Importance absolute across all sections of society

			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)** Application of knowledge and understanding is comprehensive. Analysis is clear, developed and convincing. Evaluation of the importance of carbon to humans 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 importance of carbon to humans is sound but partial. Judgements are generalised with some use of evidence leading to appropriate conclusions. **Level 1 (1-2 marks)** Application of knowledge and understanding is basic. Analysis is simple with little or no development. Evaluation of the importance of carbon to humans 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**		• Importance of carbon to flora and fauna significant because of the use of these, and need for their products in human society • Humans themselves unable to survive without carbon, being 18% carbon • Need for economic growth and development essential – carbon present in almost all compounds illustrates its use and vitality across all known areas of society • Greater importance in developing world in terms of fossil fuel use • Change in significance/importance over time e.g., increased importance has led to greater use and therefore greater need for management • No synthetic carbon available indicating their unique importance • Expect wide range of justification, accept relevant arguments

			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.		

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	1	2	3
1biv	0	2	0	2
1c*	8	8	0	16
2a	8	0	0	8
2bi	0	0	2	2
2bii	0	0	2	2
2biii	0	1	2	3
2biv	0	2	0	2
2c*	8	8	0	16
3a	8	0	0	8
3bi	0	0	2	2
3bii	0	0	2	2
3biii	0	1	2	3
3biv	0	2	0	2
3c*	8	8	0	16
4ai	0	0	2	2
4aii	0	0	1	1
4aiii	0	4	0	4
4b	6	4	0	10
4c*	8	8	0	16
Total	30	27	9	66

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