Cambridge Assessment International Education

Cambridge International AS & A Level

GEOGRAPHY **9696/33**

Paper 3 Advanced Physical Geography Options **October/November 2023**

MARK SCHEME

Maximum Mark: 60

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2023 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

A Level Geography 9696 (Paper 3 and Paper 4) specific marking instructions

Examiners must use the following annotations:

Annotation	Meaning	Use
	Correct point	Point-marked questions only: Resource-based questions part (a)
	Level 4	Levels-marked questions only: Essay questions
	Level 3	Levels-marked questions only: Resource-based questions part (b), and Essay questions
	Level 2	Levels-marked questions only: Resource-based questions part (b), and Essay questions
	Level 1	Levels-marked questions only: Resource-based questions part (b), and Essay questions
	Level 0 – No creditable response	Levels-marked questions only: Resource-based questions part (b), and Essay questions
Highlight	Creditworthy part of an extended response	Levels-marked questions only: Resource-based questions part (b), and Essay questions
Item level comment	Short statement to justify the level given for an essay, using wording from the mark scheme	Levels-marked questions only: Essay questions
	Evaluative point	Levels-marked questions only: Essay questions
	Omission or further development/detail needed to gain credit	All questions
	Unclear or validity is doubted	All questions
	Developed point	All questions
	Appropriate example or case study given	All questions
	Irrelevant	All questions
	Material that does not answer the question	All questions

Annotation	Meaning	Use
	Highlighting a significant part of an extended response – to be used with another annotation e.g. IRRL or EVAL	Levels-marked questions only: Resource-based questions part (b), and Essay questions
SEEN	1. Diagram or essay plan has been seen but no specific credit given 2. Additional page has been checked	1. Any diagrams or essay plans 2. All blank pages in the provided generic answer booklet and/or extension answer booklet(s).
R	Rubric error	Optional questions only (place at start of question not being credited): Whole paper

Examiners must consider the following guidance when marking the essay questions:

Candidates are free to develop their own approach to the question and responses will vary depending on the example(s) chosen. Whichever approach is chosen, essays which address the question and support their argument with relevant examples will be credited. The direction of the response and evaluation made will depend on the approach chosen, and any evaluation is therefore valid if argued and based on evidence.

Answer questions from **two** different options.

Tropical environments

If answering this option, answer Question 1 and **either** Question 2 **or** Question 3.

Question	Answer	Marks
1(a)	**Fig. 1.1 is a photograph which shows the vegetation of a humid tropical (rainforest) ecosystem.** **Describe the main characteristics of the vegetation shown in Fig. 1.1.** The main characteristics that might be described are: • Dense forest • A large variety of species • There are clear layers within the vegetation • Some tall trees • Wide buttress roots extending above ground level • Sparse vegetation at ground level at the base of the tree • Lianas wrapped around the trees • Large leaves • Leaves with drip tips • Some of the leaves have shiny/waxy surfaces • Trunks of the trees are straight/branchless • Mosses and other vegetation growing on the tree trunk • Many small trees in the under canopy • A sparse distribution of ferns at ground level • Leaf litter on the floor **1 mark** for each descriptive point. Only credit features that are shown in the photograph.	**4**

Question	Answer	Marks
1(b)	**Explain <u>two</u> of the characteristics of the vegetation you described in <u>(a)</u>.** The focus of the explanation should be on the features described in (a) using the photograph to substantiate the explanation. Explanation may include: • High temperatures throughout the year and high rainfall amounts throughout the year, leading to continuous and dense vegetation growth • Trees are tall and straight as they compete for sunlight • They have leafy branches at the top to get sunlight; however, lower down where there is less available light vegetation is less dense • Buttress roots support the tall trees and increase their stability • Leaves are large to maximise the area for photosynthesis and are 'waxy' with drip tips so that rainwater is shed quickly from the surface of the leaves • Little undergrowth is the result of a lack of sunlight and little penetration of rainwater due to the dense canopy • Lianas are wrapped around the tree trunks for support and extend upwards towards light for photosynthesis • Little leaf litter is the result of rapid decomposition because of the climatic conditions (high temperatures and rainfall amounts) Award marks based on the quality of explanation and breadth of the response using the marking levels below. **Level 3 (5–6)** Response clearly explains <u>two</u> of the characteristics of the vegetation described in <u>(a)</u> and is reasonably balanced between the two. Response is well founded in detailed knowledge and strong conceptual understanding of the topic. Examples used are appropriate and integrated effectively into the response. **Level 2 (3–4)** Response explains <u>two</u> of the characteristics of the vegetation described in <u>(a)</u> but in a limited manner or may explain <u>one</u> characteristic in more depth. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response comprises <u>one</u> explanation of the characteristics of the vegetation described in <u>(a)</u>, or <u>two</u> characteristics just stated in outline. Knowledge is basic and understanding may be inaccurate. Examples are in name only or lacking entirely. **Level 0 (0)** No creditable response.	**6**

Question	Answer	Marks
2	**Evaluate the role of deep weathering in the development of characteristic granite landforms of tropical environments.** Granite landforms of tropical environments include inselbergs, bornhardts and tors. One of the accepted theories of granite landform development is that deep weathering, following joints and governed by the intensity of the jointing, leads to deep weathering in some parts but partially unaffected rock in others. The importance of climate in inducing deep chemical weathering (mostly hydrolysis reflecting the mineralogy of the granite especially feldspar) also needs discussing. Stripping of the weathered material by erosion leads to the less weathered rock emerging on the surface as the landforms. Bornhardts will be formed where the granite is massive with little jointing. Tors are generally more angular features and are formed where vertical jointing is more frequent. This is the exhumation process. There are other theories, such as pediplanation and parallel retreat (more appropriate for inselbergs), so discussion of this could be part of the evaluation. Award marks based on the quality of the response using the marking levels below. **Level 4 (16–20)** Response thoroughly discusses the role of deep weathering in the development of characteristic granite landforms of tropical environments. An effective and sustained evaluation with a sound conclusion. Response is well founded in detailed exemplar knowledge and strong conceptual understanding of the topic. Examples used are appropriate and integrated effectively into the response. **Level 3 (11–15)** Response discusses the role of deep weathering in the development of characteristic granite landforms of tropical environments. Response is broadly evaluative in character, comprising some explanatory or narrative content and a conclusion. Response develops on a largely secure base of knowledge and understanding with the use of example(s). **Level 2 (6–10)** Response demonstrates some knowledge and understanding of the role of deep weathering in the development of characteristic granite landforms of tropical environments. Response is mainly descriptive or explanatory in approach and contains a brief or thinly supported evaluation. Responses without the use of example(s) to support the response will not get above the middle of Level 2 (8 marks). **Level 1 (1–5)** Response makes a few general points about the role of deep weathering in the development of characteristic granite landforms of tropical environments. A descriptive response comprising a few simple points. Knowledge is basic and understanding may be poor and lack relevance to the question set. **Level 0 (0)** No creditable response.	**20**

Question	Answer	Marks
3	**Using a case study of <u>one</u> tropical ecosystem, assess the relative significance of the problems of its sustainable management.** The response will depend on the chosen tropical ecosystem. But the answer should discuss the characteristics of the chosen tropical ecosystem and the reasons that sustainable management might be difficult. Factors might include: • Climatic characteristics such as the amounts and seasonality of the rainfall coupled with consideration of temperatures • Soils related to type and characteristics such as fertility, susceptibility to erosion, etc. • Aspects of vegetation • Human exploitation of the ecosystem (overcropping and overgrazing, deforestation, depletion of resources, tourism development) • The possible significance of fires Various aspects of sustainability could be considered such as environmental, economic and social. Award marks based on the quality of the response using the marking levels below. **Level 4 (16–20)** Response thoroughly discusses the relative significance of the problems of the sustainable management of the chosen tropical ecosystem. An effective and sustained evaluation with a sound conclusion. Response is well founded in detailed exemplar knowledge and strong conceptual understanding of the topic. Examples used are appropriate and integrated effectively into the response. **Level 3 (11–15)** Response discusses the relative significance of the problems of the sustainable management of the chosen tropical ecosystem. Response is broadly evaluative in character, comprising some explanatory or narrative content and a conclusion. Response develops on a largely secure base of knowledge and understanding with the use of example(s). **Level 2 (6–10)** Response demonstrates some knowledge and understanding of the problems of the sustainable management of the chosen tropical ecosystem. Response is mainly descriptive or explanatory in approach and contains a brief or thinly supported evaluation. Responses without the use of example(s) to support the response will not get above the middle of Level 2 (8 marks). **Level 1 (1–5)** Response makes a few general points about the problems of the sustainable management of the chosen tropical ecosystem. A descriptive response comprising a few simple points. Knowledge is basic and understanding may be poor and lack relevance to the question set. **Level 0 (0)** No creditable response.	**20**

Coastal environments

If answering this option, answer Question 4 and **either** Question 5 **or** Question 6.

Question	Answer	Marks
4(a)	**Fig. 4.1 shows the impacts of extreme weather events on coastal erosion in Kosrae State, Micronesia, Pacific Ocean.** **Describe the distribution of the impacts of extreme weather events on coastal erosion shown in Fig. 4.1.** The main points are: • Most of the places impacted are on the eastern half of the island with a few on the NW coast • There are areas of no impact along the south coast and the north west coast • The greatest concentration of high impact is on the north coast, in the municipality of Tafunsak/other significant concentrations of high impact are on the east coast and on the coast of Utwa • Areas of moderate impact are widely distributed in all the municipalities • There are concentrations of low impact particularly along the south coast (Malem) and in the north east (Lelu) • Malem is the only municipality where its entire coastline has been impacted • There is an isolated area that has been impacted in the south west (of Tafunsak) **1 mark** for each descriptive point.	**4**

Question	Answer	Marks
4(b)	**Explain <u>two</u> factors that might influence rates of erosion along coastlines.** The main factors are: • Nature of the coastal geology, rock type and structure leading to areas which are more or less resistant to erosional and weathering processes • The morphology of the coastline • Different characteristics of the waves will have an influence on the rates of erosion such as wave type and wave energy • Varying strength of winds and fetch on wave characteristics • Marine processes related to wave action • Human activity including hard/soft engineering, coastal management The emphasis should be on **rates** of erosion. Award marks based on the quality of explanation and breadth of the response using the marking levels below. **Level 3 (5–6)** Response clearly explains <u>two</u> factors that might influence rates of erosion along coastlines and is reasonably balanced between the two. Response is well founded in detailed knowledge and strong conceptual understanding of the topic. Examples used are appropriate and integrated effectively into the response. **Level 2 (3–4)** Response explains <u>two</u> factors that might influence rates of erosion along coastlines but in a limited manner or may explain <u>one</u> factor in more depth. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response describes some of the factors that influence rates of erosion along coastlines. Knowledge is basic and understanding may be inaccurate. Examples are in name only or lacking entirely. **Level 0 (0)** No creditable response.	**6**

Question	Answer	Marks
5	**Assess the extent to which management strategies can reduce threats to coral reefs.** Threats to coral reefs could include: • Warming sea surface temperatures • Acidification of the oceans • Rising sea level • Pollution from land • Physical damage, both natural (typhoons, tsunami) and human-induced • Overfishing and methods of fishing • Sedimentation from river input • Crown of Thornes starfish • Tourism and coastal development Threats to coral reefs need to be related to the conditions for healthy coral growth. Management strategies could include: • Reducing carbon emissions to slow climate change • Limiting harmful human activities • Designation of Marine Protection Areas (MPAs) • Development of regulations for fishing such as quotas • Effective monitoring of reefs • Preventing harmful coastal development • Controlling pollution from the land and sea • Eradication of Crown of Thornes starfish Award marks based on the quality of the response using the marking levels below. **Level 4 (16–20)** Response thoroughly discusses the extent to which management strategies can reduce threats to coral reefs. An effective and sustained evaluation with a sound conclusion. Response is well founded in detailed exemplar knowledge and strong conceptual understanding of the topic. Examples used are appropriate and integrated effectively into the response. **Level 3 (11–15)** Response discusses the extent to which management strategies can reduce threats to coral reefs. Response is broadly evaluative in character, comprising some explanatory or narrative content and a conclusion. Response develops on a largely secure base of knowledge and understanding with the use of example(s). **Level 2 (6–10)** Response demonstrates some knowledge and understanding of management strategies and how they can reduce threats to coral reefs. Response is mainly descriptive or explanatory in approach and contains a brief or thinly supported evaluation. Responses without the use of example(s) to support the response will not get above the middle of Level 2 (8 marks).	**20**

Question	Answer	Marks
5	**Level 1 (1–5)** Response makes a few general points about management strategies and how they can reduce threats to coral reefs. A descriptive response comprising a few simple points. Knowledge is basic and understanding may be poor and lack relevance to the question set. **Level 0 (0)** No creditable response.	

Question	Answer	Marks
6	**'Sea-level rise affects coastal depositional landforms more than coastal erosional landforms.' How far do you agree with this view?** Sea-level rise will affect both coastal depositional landforms and coastal erosional landforms. However, a small rise in sea level on a rocky coast will only affect the erosional landform slightly. However, sea-level rise may affect cliffs as the coastal area may no longer be protected by beaches and other features. Rising sea level on coasts where deposition is occurring will affect the movement of material from offshore and might affect longshore drift and the landforms associated with that such as offshore bars, some tombolos. Also, some depositional landforms will be modified by additional sediments. Award marks based on the quality of the response using the marking levels below. **Level 4 (16–20)** Response thoroughly discusses the extent to which sea-level rise affects coastal depositional landforms more than coastal erosional landforms. An effective and sustained evaluation with a sound conclusion. Response is well founded in detailed exemplar knowledge and strong conceptual understanding of the topic. Examples used are appropriate and integrated effectively into the response. **Level 3 (11–15)** Response discusses the extent to which sea-level rise affects coastal depositional landforms more than coastal erosional landforms. Response is broadly evaluative in character, comprising some explanatory or narrative content and a conclusion. Response develops on a largely secure base of knowledge and understanding with the use of example(s). **Level 2 (6–10)** Response demonstrates some knowledge and understanding of how sea-level rise affects coastal depositional landforms and coastal erosional landforms. Response is mainly descriptive or explanatory in approach and contains a brief or thinly supported evaluation. Responses without the use of example(s) to support the response will not get above the middle of Level 2 (8 marks). **Level 1 (1–5)** Response makes a few general points about the effect that sea-level rise has on coastal depositional landforms and coastal erosional landforms. A descriptive response comprising a few simple points. Knowledge is basic and understanding may be poor and lack relevance to the question set. **Level 0 (0)** No creditable response.	**20**

Hazardous environments

If answering this option, answer Question 7 and **either** Question 8 **or** Question 9.

Question	Answer	Marks
7(a)	**Fig. 7.1 shows the recurrence intervals and impacts for selected natural hazards.** **Compare the relationships between recurrence intervals and impacts for the natural hazards as shown in Fig. 7.1.** The figure represents the magnitude frequency concept which usually states that the larger and more catastrophic events are the less frequent. This is what is shown in the figure. However, there are differences between the three hazards. The main points are: • Both volcanoes and tsunamis show a proportional (positive) relationship – more severe events have higher recurrence intervals (i.e. are less frequent) • The positive relationship is more marked for volcanoes than tsunamis • Tsunamis, unlike volcanoes and earthquakes, show a steady magnitude-frequency relationship • Along with volcanoes and tsunamis, earthquakes show a positive relationship between impact and recurrence interval between 0 and 10 000 years • For earthquakes, beyond 10 000 years the severity of impact hardly varies with increasing recurrence interval • For different recurrence intervals, e.g. 10 years, 1000 years and 100 000 years, the order of relative impact changes **1 mark** for each comparison. Some specific use of evidence is required for maximum.	**3**

Question	Answer	Marks
7(b)	**Explain why volcanoes can have greater impacts than earthquakes.** There appears to be no limit to the potential impacts of volcanoes, whereas earthquakes have a maximum magnitude which can limit their impacts. Volcanoes could involve a greater variety of hazardous events such as pyroclastic flows, lava flows, ash clouds, lahars, etc. Volcanoes also have the potential to have a global impact, especially from ash clouds. Earthquakes generally affect a more limited area. Earthquakes are also short-lived events, whereas volcanic activity can continue for several months. Generally, many countries have a greater ability to prepare for earthquakes than for volcanoes. The impacts can have varying effects such as physical, social and economic aspects. Award marks based on the quality of explanation and breadth of the response using the marking levels below. **Level 3 (6–7)** Response clearly explains why volcanoes can have greater impacts than earthquakes. Response is well founded in detailed knowledge and strong conceptual understanding of the topic. Examples used are appropriate and integrated effectively into the response. **Level 2 (3–5)** Response explains why volcanoes can have greater impacts than earthquakes. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response describes how volcanoes can have greater impacts than earthquakes. Knowledge is basic and understanding may be inaccurate. Examples are in name only or lacking entirely. **Level 0 (0)** No creditable response.	**7**

Question	Answer	Marks
8	**Assess the view that high winds are the most significant hazard of large-scale atmospheric disturbances.** The main hazards from large-scale atmospheric disturbances (cyclones, hurricanes, typhoons) are storm surges, coastal flooding, intense rainfall, and high winds. These hazards also give rise to several secondary hazards including severe river floods and mass movement/landslides. The assessment will be based on specific examples where the various hazards may be assessed. It is generally accepted that most damage occurs from storm surges. Award marks based on the quality of the response using the marking levels below. **Level 4 (16–20)** Response thoroughly discusses the view that high winds are the most significant hazard of large-scale atmospheric disturbances. An effective and sustained evaluation with a sound conclusion. Response is well founded in detailed exemplar knowledge and strong conceptual understanding of the topic. Examples used are appropriate and integrated effectively into the response. **Level 3 (11–15)** Response discusses the view that high winds are the most significant hazard of large-scale atmospheric disturbances. Response is broadly evaluative in character, comprising some explanatory or narrative content and a conclusion. Response develops on a largely secure base of knowledge and understanding with the use of example(s). **Level 2 (6–10)** Response demonstrates some knowledge and understanding of whether high winds are the most significant hazard of large-scale atmospheric disturbances. Response is mainly descriptive or explanatory in approach and contains a brief or thinly supported evaluation. Responses without the use of example(s) to support the response will not get above the middle of Level 2 (8 marks). **Level 1 (1–5)** Response makes a few general points about the hazards of large-scale atmospheric disturbances. A descriptive response comprising a few simple points. Knowledge is basic and understanding may be poor and lack relevance to the question set. **Level 0 (0)** No creditable response.	**20**

Question	Answer	Marks
9	**To what extent is it difficult to prepare for mass movement hazards?** The main hazards from mass movements will be related to the type of mass movement, speed of movement and size. Hazard mapping is useful for preparing for mass movements because it will identify areas susceptible to mass movements. Monitoring slopes for mass movements is also useful. Some of the hazards from the various mass movements are more difficult to prepare for than others. Rock falls can be prepared for by pinning, bolting and nets. Rockslides and other types of sliding movement occur suddenly and are difficult to prepare for unless specific locations have been identified. Identification of mud flow hazards is usually easier because they tend to follow predictable routes, but little can be done once they occur. Prevention of mudflows is possible by comprehensive drainage of the slopes. Snow avalanches can be prepared for by triggering an event. Many mountain resorts have measures such as barriers, snow sheds, etc., to minimise the effects if an avalanche occurs. Better answers will base their assessment on specific examples. Award marks based on the quality of the response using the marking levels below. **Level 4 (16–20)** Response thoroughly discusses the extent to which it is difficult to prepare for mass movement hazards. An effective and sustained evaluation with a sound conclusion. Response is well founded in detailed exemplar knowledge and strong conceptual understanding of the topic. Examples used are appropriate and integrated effectively into the response. **Level 3 (11–15)** Response discusses the extent to which it is difficult to prepare for mass movement hazards. Response is broadly evaluative in character, comprising some explanatory or narrative content and a conclusion. Response develops on a largely secure base of knowledge and understanding with the use of example(s). **Level 2 (6–10)** Response demonstrates some knowledge and understanding of the difficulty in preparing for mass movement hazards. Response is mainly descriptive or explanatory in approach and contains a brief or thinly supported evaluation. Responses without the use of example(s) to support the response will not get above the middle of Level 2 (8 marks). **Level 1 (1–5)** Response makes a few general points about the difficulty in preparing for mass movement hazards. A descriptive response comprising a few simple points. Knowledge is basic and understanding may be poor and lack relevance to the question set. **Level 0 (0)** No creditable response.	**20**

Hot arid and semi-arid environments

If answering this option, answer Question 10 and **either** Question 11 **or** Question 12.

Question	Answer	Marks
10(a)	**Fig. 10.1 shows the influence of sand supply, wind and vegetation on the type of sand dune.** **Describe the general relationship between sand supply, wind and vegetation and the type of sand dune shown in Fig. 10.1.** The main points that could be noted are: • Transverse dunes are formed when sand supply has the greatest influence, vegetation cover has the least influence and wind strength has variable influence • Longitudinal dunes are formed when winds have the greatest influence, sand supply has the least influence and vegetation has an intermediate influence • Parabolic dunes are generally formed when there is a more balanced influence between the three factors **1 mark** for each descriptive point. **Reserve 1 mark** for use of data.	**4**

Question	Answer	Marks
10(b)	**Explain the formation of sand dunes.** The detail will depend on the type of sand dune chosen to explain. There are many types of sand dunes, but the main ones are barchans, seif (longitudinal) dunes and star dunes. Barchans and seif dunes are formed where wind blows from a constant direction, whereas star dunes are formed where winds vary in direction. There are different types of sand dune. All are formed by wind action, but other factors may determine the type of dune. For example: Barchans are crescent shaped dunes formed when an obstacle initially traps sand, which accumulates. Wind is usually from a constant direction, and sand accumulates on the windward side and forms a slope of up to 30° (angle of repose). A 'dead zone' forms on the leeward side where there is little wind and the sand spills over into this area. When this happens, the dune is in equilibrium, and it moves forward as a whole, with the outer edges of the barchans forming horns which move faster than the centre. Award marks based on the quality of explanation and breadth of the response using the marking levels below. **Level 3 (5–6)** Response clearly explains the formation of sand dunes. Response is well founded in detailed knowledge and strong conceptual understanding of the topic. Examples used are appropriate and integrated effectively into the response. **Level 2 (3–4)** Response explains the formation of sand dunes. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response describes the formation of sand dunes. Knowledge is basic and understanding may be inaccurate. Examples are in name only or lacking entirely. **Level 0 (0)** No creditable response.	**6**

Question	Answer	Marks
11	**To what extent are plants in hot arid and semi-arid environments adapted to physical and physiological drought rather than extreme temperatures?** Adaptation to extreme temperatures may differ from adaptation to drought, although there will be some overlap in the adaptations. Plants in arid areas have to be adapted to both extreme temperature and drought, though adaptations to drought are probably more significant. Examples of species to support the argument could include succulents, cacti, baobab trees and acacias. Adaptation to extreme temperatures includes characteristics that reduce transpiration such as: • Small stomata on the undersides of leaves • Waxy leaves to reduce transpiration loss • Light colours which reflect radiation rather than absorbing it • Small surface area of leaves • Resistance to high salinity of groundwater Adaptations to drought include: • Small leaves to reduce transpiration loss • Succulents store water in plant tissue • Uptake of water from dew • Extensive root networks, either shallow lateral roots to take up water quickly after rainfall or deep tap roots to access soil and groundwater • Sunken stomata on the undersides of leaves • Dormancy of seeds/'water clocks' • Reproduction suppressed in long drought • Protection from animals getting at their water, e.g. thorns, spikes, etc. Award marks based on the quality of the response using the marking levels below. **Level 4 (16–20)** Response thoroughly discusses the extent to which plants in hot arid and semi-arid environments are adapted to physical and physiological drought rather than extreme temperatures. An effective and sustained evaluation with a sound conclusion. Response is well founded in detailed exemplar knowledge and strong conceptual understanding of the topic. Examples used are appropriate and integrated effectively into the response. **Level 3 (11–15)** Response discusses the extent to which plants in hot arid and semi-arid environments are adapted to physical and physiological drought rather than extreme temperatures. Response is broadly evaluative in character, comprising some explanatory or narrative content and a conclusion. Response develops on a largely secure base of knowledge and understanding with the use of example(s).	**20**

Question	Answer	Marks
11	**Level 2 (6–10)** Response demonstrates some knowledge and understanding of the extent to which plants in hot arid and semi-arid environments are adapted to physical and physiological drought rather than extreme temperatures. Response is mainly descriptive or explanatory in approach and contains a brief or thinly supported evaluation. Responses without the use of example(s) to support the response will not get above the middle of Level 2 (8 marks). **Level 1 (1–5)** Response makes a few general points about plant adaptations to physical and physiological drought and extreme temperatures. A descriptive response comprising a few simple points. Knowledge is basic and understanding may be poor and lack relevance to the question set. **Level 0 (0)** No creditable response.	

Question	Answer	Marks
12	**Using a case study of <u>either</u> a hot arid <u>or</u> a semi-arid environment, evaluate solutions to the problems of its sustainable management.** The detail will depend on the environment chosen. In either case, the assessment should be with respect to a specific case study. The emphasis will be on the problems of the specific environment for its sustainable development and the success or otherwise of solutions to those problems. All aspects of sustainability could be evaluated. Problems will relate to the extreme environment – heat and lack of moisture/water – but other physical factors may be considered such as other climatic elements, soils, relief, and human factors may be considered (capital, government, population pressure, conflict, etc.). Response may take the form of a description of the case study such as location, problems to be overcome, what has been done and an evaluation of success or otherwise. Award marks based on the quality of the response using the marking levels below. **Level 4 (16–20)** Response thoroughly discusses the solutions to the problems of sustainable management of the chosen environment. An effective and sustained evaluation with a sound conclusion. Response is well founded in detailed exemplar knowledge and strong conceptual understanding of the topic. Examples used are appropriate and integrated effectively into the response. **Level 3 (11–15)** Response discusses the solutions to the problems of sustainable management of the chosen environment. Response is broadly evaluative in character, comprising some explanatory or narrative content and a conclusion. Response develops on a largely secure base of knowledge and understanding with the use of example(s). **Level 2 (6–10)** Response demonstrates some knowledge and understanding of the solutions to the problems of sustainable management of the chosen environment. Response is mainly descriptive or explanatory in approach and contains a brief or thinly supported evaluation. Responses without the use of example(s) to support the response will not get above the middle of Level 2 (8 marks). **Level 1 (1–5)** Response makes a few general points about the problems of the sustainable management of either a hot arid or a semi-arid environment but without reference to a specific case study. A descriptive response comprising a few simple points. Knowledge is basic and understanding may be poor and lack relevance to the question set. **Level 0 (0)** No creditable response.	**20**