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CAMBRIDGE
International Education

Cambridge International AS & A Level

GEOGRAPHY **9696/31**

Paper 3 Advanced Physical Geography Options **May/June 2026**

MARK SCHEME

Maximum Mark: 60

Published

This mark scheme contains the instructions and marking guidance that our examiners used to mark candidate responses for this component.

Before they start marking, examiners complete a standardisation process. They review a range of candidate responses and discuss the mark scheme in detail to agree which answers can and cannot be accepted. Examiners award marks where it is clear that candidate responses have met the requirements of the mark scheme. These requirements may vary between different components or different versions of the same component, depending on the exact requirements of the question and the candidate responses seen during the standardisation process.

Sometimes, our mark schemes may allow marks to be awarded to responses which contain elements that are factually incorrect or for content not covered by the syllabus. We do this in response to the demands of a specific question to support candidates and make sure that our assessments are fair. However, these allowances should not be used as a guide for teaching and learning.

We cannot discuss the mark scheme with schools, and we recommend that schools read the mark scheme together with the assessment material and the Principal Examiner Report for Teachers.

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General marking principles

All examiners must apply these marking principles when marking candidate responses.

1	Examiners must award marks for each response in line with: • the specific **content** defined in the mark scheme • the specific **skills** defined in the mark scheme or in the level descriptions • the **standard of response** required as exemplified by the standardisation scripts.
2	Examiners must award **whole marks** (not half marks, or other fractions).
3	Examiners must award marks **positively**. This means that: • marks are not deducted for errors or omissions • marks are awarded for correct/valid answers as defined in the mark scheme and also for **other valid answers** which go beyond the scope of the syllabus and mark scheme referring to your team leader as appropriate • the quality of spelling, punctuation and grammar are judged **only** when the mark scheme indicates that these features are **specifically assessed** in the question. However, the meaning of all responses must be unambiguous.
4	Examiners must **consistently** apply the requirements of the mark scheme and any rules for what to do when candidates have not followed instructions correctly.
5	Examiners must use the **full range of marks** defined in the mark scheme, unless limited by the quality of the candidate responses seen.
6	Examiners must award marks according to the mark scheme and **must not** award marks with grade thresholds or grade descriptions in mind.

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Annotations guidance for centres

Examiners use a system of annotations as a shorthand for communicating their marking decisions to one another. Examiners are trained during the standardisation process on how and when to use annotations. The purpose of annotations is to inform the standardisation and monitoring processes and guide the supervising examiners when they are checking the work of examiners within their team. The meaning of annotations and how they are used is specific to each component and is understood by all examiners who mark the component.

We publish annotations in our mark schemes to help centres understand the annotations they may see on copies of scripts. Note that there may not be a direct correlation between the number of annotations on a script and the mark awarded. Similarly, the use of an annotation may not be an indication of the quality of the response.

The annotations listed below were available to examiners marking this component in this series.

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
Highlighter	Creditworthy part of an extended response	Levels-marked questions only: Resource-based questions part (b), and Essay questions
Off-page 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

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Annotation	Meaning	Use
	Unclear or validity is doubted	All questions
DEV	Developed point	All questions
EG	Appropriate example or case study given	All questions
IRRL	Irrelevant	All questions
NAQ	Material that does not answer the question	All questions
	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.

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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)	**Figure 1.1 is a photograph which shows a karst landscape in Viet Nam.** **Describe the main features of the karst landscape shown in Figure 1.1.** Main features of the karst landscape include: • Considerable variation in relief • Flat valley floor/areas of flat land in foreground… • … with continuous vegetation cover of grass/crops/green fields • Ponds/drainage ditches on the flat land • Isolated/spaced out hills/steep sided upland areas • Upland areas are largely vegetated with trees/bushes/shrubs… • … but with areas of exposed bare rock • Some areas of rock, such as those in the foreground, are heavily dissected/rough/weathered… • … whereas others, such as left foreground, are almost vertical/very steep /and smoother • The background area is mainly hilly upland, but with areas of lower land between the individual hills Do not credit reference to settlements. **1 mark** for each descriptive point. Use of photograph as evidence for **maximum marks**.	**4**

9696/31 Mark Scheme June 2026

Question	Answer	Marks
1(b)	**Suggest how the features of the karst landscape you described in 1(a) have formed.** Processes involved in the formation of karst landforms include: • Solution/carbonation weathering • Vertical fluvial erosion • Tectonic uplift • Cavern collapse • Slope retreat/undercutting by rivers Influences on the karst landscape include: • Variability in the physical characteristics of the limestone: larger joint width and/or closer spacing of joints, or even the presence of faults, exposes a great surface area to weathering agents • Variability in the chemical composition and resistance of the limestone to weathering processes • Surface relief: areas of lower elevation tend to have a greater depth of weathering. This is likely to relate to water accumulating in lower lying areas, running off and through the surrounding slopes • Presence of water: greater water availability from precipitation, likely over high altitude areas, provides a medium for chemical reactions and so faster and deeper weathering • Microclimatic variations: higher temperatures in the more sheltered, lower lying areas act as a catalyst to chemical reactions leading to faster and deeper chemical weathering Candidates may suggest generic processes/factors, but better answers will recognise that this is tower karst, formed as a development from cockpit. The key in either case will be for candidates to effectively link processes/factors to the features/landforms. Allow credit for an explanation of the vegetation and/or the ponds, if they have been mentioned in the response to 1(a). 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 the features of the karst landscape described in 1(a). 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 the features of the karst landscape described in 1(a). Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response is largely descriptive of the formation of some of the features of the karst landscape described in 1(a). Knowledge is basic and understanding may be inaccurate. Examples are in name only or lacking entirely.	**6**

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Question	Answer	Marks
1(b)	**Level 0 (0)** No creditable response.	

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Question	Answer	Marks
2	**Assess the extent to which there are differences between the plant communities of humid tropical (rainforest) ecosystems and seasonally humid tropical (savanna) ecosystems.** Responses should provide direct and explicit comparison between the two types of ecosystem. There will be some similarities, but many differences. Features of the plant communities could include: • Dominant species • Diversity • Density, type, height • Spatial variation Rainforest plant communities are dominated by large, evergreen trees, with a vertical structure of distinctive layers such as emergent, canopy, under canopy, ground. There will be some spatial variation depending upon altitude, relief, soils and drainage. The rainforest ecosystem has a net primary productivity (NPP) of 2200 g/m^2/year. Savanna plant communities are adapted to the dry season (xerophytic) and fire (pyrophytic) and are dominated by grasses e.g. elephant grass, with some shrubs/bushes and relatively few trees e.g. baobab. The plant community has significant spatial variation with latitudinal change, with a sequential progression from woodland to parkland and finally scrub as the climate differs. The savanna ecosystem has a net primary productivity (NPP) of 900 g/m^2/year. There may be reference to differences over time as a result of human activity e.g. • Traditional shifting cultivation in the rainforest leaving essentially a secondary forest vegetation community • More recent deforestation in the rainforest, leading to reduced biodiversity • Bushfires/grazing in the savanna producing a plagioclimax vegetation community. 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 there are differences between the plant communities of humid tropical (rainforest) ecosystems and seasonally humid tropical (savanna) ecosystems. 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 there are differences between the plant communities of humid tropical (rainforest) ecosystems and seasonally humid tropical (savanna) ecosystems. 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**

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Question	Answer	Marks
2	**Level 2 (6–10)** Response demonstrates some knowledge and understanding of the extent to which there are differences between the plant communities of humid tropical (rainforest) ecosystems and seasonally humid tropical (savanna) ecosystems. 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 differences between the plant communities of humid tropical (rainforest) ecosystems and seasonally humid tropical (savanna) ecosystems. 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.	

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Question	Answer	Marks
3	**Using a case study, evaluate the attempted solutions to the threats to the sustainable management of <u>either</u> the rainforest ecosystem <u>or</u> the savanna ecosystem.** Responses should be focused on the threats to the chosen case study, with clear links established between the specific threats faced and the attempted solutions. Threats and solutions may differ between the two types of ecosystem. Responses without at least one clear case study/place-specific detail – **Max. 8 marks** (middle of Level 2). Threats might include: • Illegal logging • Commercial agriculture, including monoculture, ranching, plantations • Mining • Population pressures/urbanisation • Climate change • Fire • Economic factors, such as the need for national GDP growth, and the pressure for profit (individual or company or TNC) Solutions might include: • National Parks/nature reserves • Socially responsible logging • Biosphere reserves • Sustainable tourism/ecotourism • Quotas • Afforestation/reforestation schemes • Education Criteria for evaluating success should be established. These might include economic, social, and environmental aspects of sustainability as well as their longevity. Award marks based on the quality of the response using the marking levels below. **Level 4 (16–20)** Response thoroughly discusses the attempted solutions to the threats to the sustainable management of <u>either</u> the rainforest ecosystem <u>or</u> the savanna ecosystem using a case study. 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 attempted solutions to the threats to the sustainable management of <u>either</u> the rainforest ecosystem <u>or</u> the savanna ecosystem using a case study. 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**

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Question	Answer	Marks
3	**Level 2 (6–10)** Response demonstrates some knowledge and understanding of the attempted solutions to the threats to the sustainable management of either the rainforest ecosystem or the savanna ecosystem using a case study. 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 threats and/or solutions to the sustainable management of either the rainforest ecosystem or the savanna 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.	

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Coastal environments

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

Question	Answer	Marks
4(a)	**Figure 4.1 shows wave height at a location on the coast of south-west France, March–April 2010.** **Describe the main variations in wave height shown in Figure 4.1.** The main variations are: • Overall, there is a slight trend of decreasing wave height over time • Wave height is very variable/has large fluctuations • Maximum wave height of 6.5 m on 27 March / Minimum wave height of 0.5 m on 10/11/14 April • Range of wave heights is 6 m • 19 March–25 March wave height is low/has small fluctuations • 26 March–6 April has much larger fluctuations/with a difference of 4–5 m • Variations occur around a mean value of approximately 3.5 m • There are 3 or 4 distinctive peaks of 2.5 m or more in late March/early April • From 26 March onwards the peaks get successively smaller • 26 March–9 April appears to have some form of regular periodicity with 4–5 days between each peak • Fluctuations after 6 April are less significant with heights typically 2.5 m or less **1 mark** for each descriptive point. **Max. 3 marks** without the use of data.	**4**

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Question	Answer	Marks
4(b)	**Suggest reasons for the variations in wave height you described in 4(a).** The wave height data in Figure 4.1 is for a single location, so reasons should explain the temporal variation over the short period shown. Reasons for the variations in wave height could include: • Variations in wind speed/strength • Changes in wind direction / duration / length of fetch • Atmospheric pressure differences • Tidal cycle The key is for reasons suggested to be applied to the data in Figure 4.1: • South-west France is exposed to prevailing winds from the west and the fetch is very long extending across the Atlantic Ocean, so high wave heights shown are not unusual • 19 March–25 March could be due to an offshore wind, gentler wind or southerly wind (where the fetch is shorter) • 26 March onwards could be due to westerly winds over a long fetch, with variations in wind speed occurring every 4–5 days possibly linked to the movement of Spring depressions over the Atlantic Other than the fact that this is a SW facing coast, which has been given, specific locational knowledge is not a requirement. 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 reasons for the variations in wave height described in 4(a). 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 reasons for the variations in wave height described in 4(a). Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response offers at least one reason for variations in wave height although not necessarily linked to the data set provided. Knowledge is basic and understanding may be inaccurate. Examples are in name only or lacking entirely. **Level 0 (0)** No creditable response.	**6**

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Question	Answer	Marks
5	**'Beaches vary in their profile and plan only because of differences in their sediment.' How far do you agree with this statement?** Responses should refer explicitly to both profile and plan. Factors other than sediment should be considered as well, to enable effective evaluation. Different factors may be more/less important for profile compared to those for plan. Factors could include: • Sediment e.g. amount, size and shape, sources • Wind/wave direction • Wind/wave energy • Wave refraction • Longshore drift • Tides/tidal range • Coastal topography e.g. gradient of nearshore zone • Human activity e.g. groynes, beach nourishment 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 beaches vary in their profile and plan only because of differences in their sediment. 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 beaches vary in their profile and plan only because of differences in their sediment. 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 extent to which beaches vary in their profile and plan only because of differences in their sediment. 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 sediment and/or other factor(s) affecting variations in beaches. 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**

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Question	Answer	Marks
6	**Evaluate the effectiveness of strategies used to manage threats to coral reefs.** Responses should provide explicit links between the threats and the strategies used in their management. Threats to coral reefs should focus on what affects the ideal conditions for coral growth. Effectiveness could be judged in terms of cost/benefit analysis and/or sustainability. Different stakeholders/interest groups may have contrasting views on effectiveness. Threats to coral reefs include: • Global warming – increased sea temperatures, increased ocean acidity, coral bleaching • Sea-level rise – causing submergence and change in habitat but only if the coral is already under stress / low level threat as coral can grow faster than sea level rises • Acidification of sea-water • Pollution – land and marine sources, oil spills, industrial waste, phosphates in treated sewage, nitrate run-off • Physical damage – fishing, tourism, storms • Invasive species Management strategies include: • Reducing greenhouse gas emissions • Carbon capture and storage • Creating marine protection areas/zones • Restricting fishing/blasting/sedimentation • Ecotourism/sustainable tourism initiatives • Developing alternative economic activities • Treating pollution • Education of locals/tourists to increase awareness of the issues Effectiveness may be judged by cost-benefit analysis, with consideration of social, economic and environmental costs and benefits. Management strategies should be assessed in terms of their sustainability. Award marks based on the quality of the response using the marking levels below. **Level 4 (16–20)** Response thoroughly discusses the effectiveness of strategies used to manage 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 effectiveness of strategies used to manage 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).	**20**

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Question	Answer	Marks
6	**Level 2 (6–10)** Response demonstrates some knowledge and understanding of the effectiveness of strategies used to manage 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). **Level 1 (1–5)** Response makes a few general points about strategies used to manage 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.	

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Hazardous environments

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

Question	Answer	Marks
7(a)	**Figure 7.1 shows slope profiles at a location in Asia before and after mass movement processes.** **Compare the slope profiles before and after mass movement processes shown in Figure 7.1.** Compare requires description of the similarities and differences. The main similarities include: • The slopes are the same overall length: 315 m • The change in height is the same: 955 m to 775 m • Therefore, overall gradient is the same • From 175 m down to the base, the slopes have a similar profile and gradient The main differences include: • Overall, the slope had a more irregular/uneven profile after mass movement than before/which was smoother/more even • Overall, the slope has lost volume at the surface after mass movement • Throughout the slope profile, the elevation of the slope before mass movement is consistently higher than after the mass movement • The largest difference in elevation is in the top half of the slope/by as much as 30 m at 75 m from the top of the slope • There is much less change in elevation from 175 m to the foot of the slope/by 10 m or less • The top of the slope, for about 85 m down, is steeper after mass movement • From 85 m to 125 m down, the slope is less steep after mass movement **1 mark** for each comparison. Direct comparison should be made. **Max. 3 marks** without the use of data. **Max. 3 marks** if only similarities or differences.	**4**

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Question	Answer	Marks
7(b)	**Suggest how mass movement processes caused the changes to the slope profile shown in Figure 7.1.** The slope has been affected by some forms of mass movement causing the changes described. No further information is given about the geographical setting and so any reasonable suggestions relating to mass movement processes should be credited. Reasons for the mass movement could include: • Heavy rainfall/loosening internal cohesion/and adding weight • Joints and bedding planes in the sub-strata • Weathering of slope material by e.g. freeze–thaw • Ground shaking from an earthquake • Human activity such as undercutting by road construction/building/ deforestation on the slope These reasons should be linked to the type of mass movement suggested. Reasons for the changes in the slope profile could include: • The steepness and curvature of the profile at the top after suggests a rotational slide or slump has occurred • This would have resulted in movement of material from the top of the slope towards the base • This would have led to an increase in steepness at the top of the slope • After an initial slide, debris is likely to have moved further downslope under gravity/perhaps by further slide(s), or flow(s) (so there is not a build-up at the bottom of the slope shown in Figure 7.1) • This could have caused further modifications to the profile, both to enhance the changes and, elsewhere, to reduce the extent of the changes These reasons should be linked to the nature of the slope shown in Figure 7.1 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 how mass movement processes caused the changes to the slope profile shown in Figure 7.1. 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 how mass movement process caused the changes to the slope profile shown in Figure 7.1. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response is largely descriptive of how mass movement processes caused the changes to the slope profile shown in Figure 7.1. Knowledge is basic and understanding may be inaccurate. Examples are in name only or lacking entirely.	**6**

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Question	Answer	Marks
7(b)	**Level 0 (0)** No creditable response.	

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Question	Answer	Marks
8	**Assess the extent to which impacts of earthquakes on lives and property depend on their magnitude.** The impacts may be quantified in terms of numbers of people/buildings affected, the length of time the impacts lasted, the areal extent of the impacts and the financial costs involved. There are a number of factors that will influence the type and scale of impacts, and these are likely to act in combination. Impacts on lives include: • Death or injury – often during building collapse • Disease/illness – from damaged sewerage systems or loss of fresh water supply • Disruption to life – due to damaged infrastructure, loss of employment Impacts on property include: • Building collapse – due to ground shaking and/or liquefaction • Buildings weakened – by cracks/fractures resulting from swaying/shaking • Damage to transport infrastructure – collapse of road/rail bridges, fracturing of roads Some of these may be linked e.g. collapse of medical care buildings restricting assistance for the injured. Influencing factors include: • Magnitude of event • Depth of earthquake focus • Number and intensity of aftershocks • Type(s) of seismic waves generated • Distance from epicentre • Geology/regolith • Secondary hazards, such as landslides and tsunami • Population density • Building design/construction • Time of day/night • Level of economic development/level of preparedness/education • Availability of real-time warnings Candidates may comment on how factors can influence the differences between primary and secondary impacts. 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 impacts of earthquakes on lives and property depend on their magnitude. 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.	**20**

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9696/31 Mark Scheme June 2026

GradeMax

Question	Answer	Marks
8	**Level 3 (11–15)** Response discusses the extent to which impacts of earthquakes on lives and property depend on their magnitude. 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 extent to which impacts of earthquakes on lives and property depend on their magnitude. 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 impacts of earthquakes on lives and/or property and/or their influencing factors. 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.	

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Question	Answer	Marks
9	**'The processes causing the formation and development of large-scale atmospheric disturbances (cyclones, hurricanes, typhoons) and small-scale atmospheric disturbances (tornadoes) are the same.'** **How far do you agree with this statement?** Processes causing the formation and development of large-scale atmospheric disturbances (cyclones, hurricanes, typhoons) include: • Convergence of pre-existing winds into a low-pressure area close to the equator over the sea • Warm oceanic water heats the air above it • Warmed air rises due to convection • Coriolis Force creates rotation in the rising air • Rising air cools and condenses forming clouds • Latent heat adds further energy to the developing storm • The storm moves westwards, driven by the converging trade winds • As it makes land fall it is deflected polewards • Over land it loses its sources of heat and moisture and gradually dissipates as air pressure increases Processes causing the formation and development of small-scale atmospheric disturbances (tornadoes) include: • Sunshine heats the ground, which heats the air near ground level • Localised pockets of air become warmer than their surroundings and begin to rise creating thermals • If thermals rise to sufficient height, shallow cumulus clouds develop due to air cooling and water vapour condensing • Updraughts and associated deep cumulus and cumulonimbus clouds can develop if the surrounding air is cooler • If winds increase strongly with height (strong vertical wind shear), the thunderstorm updraught may begin to rotate developing into a supercell • Downdraughts in the supercell concentrate the rotation, bringing it down to lower levels • Eventually the rotation may become so strongly focused that a narrow column of violently rotating air forms, which if it reaches the ground a tornado is formed • Cold downdraughts eventually wrap around the tornado, cutting off the supply of warm air, the tornado narrows and eventually the vortex dissipates • Reference to factors influencing tornado formation in Mid-West USA may also be credited A few of the processes involved in the formation and development of both types are the same while most are different. Candidates will need to evaluate how far they agree with the statement that they are the same. Award marks based on the quality of the response using the marking levels below.	**20**

GradeMax

Question	Answer	Marks
9	**Level 4 (16–20)** Response thoroughly discusses the extent to which the processes causing the formation and development of large-scale atmospheric disturbances (cyclones, hurricanes, typhoons) and small-scale atmospheric disturbances (tornadoes) are the same. 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 the processes causing the formation and development of large-scale atmospheric disturbances (cyclones, hurricanes, typhoons) and small-scale atmospheric disturbances (tornadoes) are the same. 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 extent to which the processes causing the formation and development of large-scale atmospheric disturbances (cyclones, hurricanes, typhoons) and small-scale atmospheric disturbances (tornadoes) are the same. 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 processes involved in the formation and development of <u>at least one of</u> large-scale atmospheric disturbances (cyclones, hurricanes, typhoons) <u>or</u> small-scale atmospheric disturbances (tornadoes). 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.	

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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)	**Figure 10.1 shows a cross-sectional diagram of a landscape in a hot arid environment.** **Describe the main features of the cross-section of the landscape shown in Figure 10.1.** Main features include: • Gently sloping alluvial fan (approximately 250 m long) • Flat playa (approximately 100 m long) • Hills/low-permeability bedrock in the west rising to 250 m/Hills/low-permeability bedrock to the east at 150 m • The whole area is underlain by low-permeability bedrock • Bedrock goes down to just above 0 m/25 m • Different/several layers of sediment below the alluvial fan surface (clay, sand and gravel) • …but consisting just of gravel nearest the western hills • Playa consists mainly of clay and silt deposits… • … with small areas of gravel and sand on the right-hand/eastern edge • Overall, the sediments have a depth/thickness of approximately 100 m **1 mark** for each descriptive point. **Max. 3 marks** without the use of data.	**4**

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GradeMax

Question	Answer	Marks
10(b)	**Explain the formation of an alluvial fan.** Alluvial fans form when flowing water passes through a narrow gap/wadi/valley, such as between mountains, hills, or canyon walls. The flowing water picks up sediments and rocks as it flows through this narrow gap. The water then opens onto an open plain, where the sediments are deposited in a cone-shape. The largest, heaviest sediment, gravel, is deposited first as the flowing water slows and loses energy for transportation. The finer materials, sand, silt and clay, can be carried further as they require less energy to be transported. Differences in the volume and speed of flow over time result in larger material being carried further in times of high flow with more energy, giving variation in the vertical layering. 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 an alluvial fan. 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 an alluvial fan. 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 an alluvial fan. Knowledge is basic and understanding may be inaccurate. Examples are in name only or lacking entirely. **Level 0 (0)** No creditable response.	**6**

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Question	Answer	Marks
11	**'The problems of sustainable management <u>cannot</u> be solved.'** **Using a case study of <u>either</u> a hot arid environment <u>or</u> a semi-arid environment, how far do you agree with this statement?** The detail provided will depend on the environment chosen and the nature of the case study. Responses without a clear case study/place-specific detail – **Max. 8 marks** (middle of Level 2). Problems of sustainable management could include: • Generic problems of achieving balance between social/economic/ environmental needs • Generic problems of short-term vs long-term management approaches • Lack of education • Limited economic development in some locations • Weak/ineffective governance • Lack of rainfall/drought • Climate change • Desertification and soil degradation • Deforestation as a result of population growth • Poor agricultural practices – overgrazing/overcultivation • Fuelwood collection Solutions to the problems could include: • Development of local craft industries supporting the local economy • Breeding programmes for crops and animals that are more sustainable/reduce animal stock densities to prevent overgrazing • Ecotourism • Sustainable methods of resource exploitation/irrigation • Planning controls and land use zoning such as the creation of National Parks and Nature Reserves • Regulations to reduce the harmful use of the chosen environment • Education programmes • Nomadic pastoralism and paddocking • Crop rotation to prevent further degradation or loss of soil • Drought-resistant crops • Windbreaks, afforestation (Great Green Wall) to reduce wind erosion and prevent soil erosion/provide jobs, fuelwood, fruits, etc. for local people • Building earth dams/large-scale catchment management schemes to store water in the wet season Responses should make explicit links between the problems and the solutions and demonstrate a clear understanding of the concept of sustainable management. Award marks based on the quality of the response using the marking levels below.	**20**

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GradeMax

Question	Answer	Marks
11	**Level 4 (16–20)** Response thoroughly discusses the extent to which the problems of sustainable management cannot be solved for a case study of either a hot arid environment or a semi-arid 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 extent to which the problems of sustainable management cannot be solved for a case study of either a hot arid environment or a semi-arid 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 extent to which the problems of sustainable management cannot be solved for a case study of either a hot arid environment or a semi-arid 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 solutions and/or the problems of sustainable management for either a hot arid environment or a semi-arid environment. 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.	

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GradeMax

Question	Answer	Marks
12	**To what extent is latitude the main cause of differences between the climatic characteristics of hot arid environments and semi-arid environments?** Climatic differences include: • Rainfall typically 200–500 mm for semi-arid and <200 mm for hot arid • Average temperatures typically 15–25 °C in semi-arid and 25–35 °C in hot arid • Meig's Index of aridity typically between –40 and –20 for semi-arid, • and < –40 for hot arid • UNEP Index of aridity 0.20–0.50 for semi-arid, and <0.20 for arid Factors influencing climatic characteristics include: • Latitude and the role of the ITCZ • Subtropical high-pressure • Continentality • Cold ocean currents • Rain-shadow effect Candidates are likely to argue that the differences in the two climates are largely the result of latitude and, therefore, the angle of the overhead sun during the year. The other factors can also have an influence. Responses that focus on the reasons for general aridity, rather than the reasons for the differences between hot arid environments and semi-arid environments should be given credit up to the **middle of Level 3 (13 marks)**. 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 latitude is the main cause of differences between the climatic characteristics of hot arid environments and semi-arid 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 extent to which latitude is the main cause of differences between the climatic characteristics of hot arid environments and semi-arid 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 extent to which latitude is the main cause of differences between the climatic characteristics of hot arid environments and semi-arid 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).	**20**

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GradeMax

Question	Answer	Marks
12	**Level 1 (1–5)** Response makes a few general points about reasons for the differences in the climatic characteristics of hot arid environments and semi-arid 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.	

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