CAMBRIDGE
International Education

Cambridge International AS & A Level

GEOGRAPHY **9696/13**

Paper 1 Core Physical Geography **October/November 2024**

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 2024 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 descriptions 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.

AS Level Geography 9696 (Paper 1 and Paper 2) specific marking instructions

Examiners must use the following annotations:

Annotation	Meaning	Use
	Correct point	Point-marked questions only: Section A, Section B part (a)
	Incorrect	Point-marked questions only: Section A, Section B part (a)
L4	Level 4	Levels-marked questions only: Section B part (c)
L3	Level 3	Levels-marked questions only: Section B parts (b) and (c)
L2	Level 2	Levels-marked questions only: Section B parts (b) and (c)
L1	Level 1	Levels-marked questions only: Section B parts (b) and (c)
0	Level 0 – No creditable response	Levels-marked questions only: Section B parts (b) and (c)
Highlight	Creditworthy part of an extended response	Levels-marked questions only: Section B parts (b) and (c)
EVAL	Evaluative point	Levels-marked questions only: Section B part (c)
^	Omission or further development/detail needed to gain credit	All questions
	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: Section B parts (b) and (c)

Annotation	Meaning	Use
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): Section B (Candidates answer one question)

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 approach chosen. Whichever approach is chosen, essays which address the question and support their argument with relevant examples will be credited. There may be detailed consideration of a case study/one or more examples, or a broadly conceived response, drawing on several examples to illustrate the factors involved.

Section A

Answer **all** questions in this section. All questions are worth 10 marks.

Hydrology and fluvial geomorphology

Question	Answer	Marks
1(a)	**Fig. 1.1 shows a diagram of a delta in a lake under two climatic conditions.** **Identify feature A shown in Fig. 1.1.** Distributary [do <u>not</u> accept river channel]	**1**
1(b)	**Compare the characteristics of the deltas shown in Fig. 1.1.** Comparisons could include: • Both have a branching network of distributaries diverging away from the main channel • Many more distributaries in wet conditions / braiding only in wet conditions • Deltas extended further in wet conditions • Larger size of outer delta front in wet conditions / narrower outer delta front in dry conditions • No deposited fine-grained material in dry conditions / some deposited materials in prodelta area in wet conditions • Greater size of delta plain in dry conditions • Extent of delta plain, inner delta front and outer delta front are fairly equal in wet conditions but uneven in dry conditions **1 mark** for each comparison.	**4**

Question	Answer	Marks
1(c)	**Explain the factors that influence the size and shape of deltas.** Size is essentially a function of the relationship between river discharge, the sediment load and type and effect of tidal and marine processes. The largest deltas are created by rivers with a high discharge and minimal counteraction by marine processes. The specific shape is also determined by the relationships between river processes (birds foot delta) and tidal action/currents (cuspate, arcuate). Shape: • Bird's foot delta - a powerful river with a large sediment load entering a sea with low tidal currents • Cuspate delta – when rivers deposit sediment in areas with strong wave action from two different directions • Arcuate delta – is able to form when the tidal range is low and the currents remove the sediment, forming a smooth fan shaped delta Size • Salt content in water influences flocculation – less in freshwater so delta likely to be larger. • Rainfall influences density of distributaries and amount of depositional material • Vegetation stabilises deltas • Depth of marine seabed **1 mark** for a simple explanation, **2 marks** for a detailed explanation up to the maximum.	**5**

Atmosphere and weather

Question	Answer	Marks
2(a)	**Fig. 2.1 shows changes in the difference between summer and winter temperatures, 1979–2016.** **State the change in the difference between summer and winter temperatures for location X shown in Fig. 2.1.** 0.0 to -0.04 °C/(decade) **or** -0.04 °C to 0.0 °C/(decade)	**1**
2(b)	**Describe the global distribution of the changes in the difference between summer and winter temperatures shown in Fig. 2.1.** Description could include: • Increases/greater difference over northern and southern high latitudes • Greater increase/difference in northern latitudes, particularly over continents • Little change over the tropics and Equator • Biggest decrease over India and southeast Asia • Biggest decrease over polar areas • Alternating areas of increase and decrease along the equator **1 mark** for each description. Full marks cannot be obtained without the use of data.	**4**
2(c)	**Explain why temperatures are increasing globally**. Discussions could include: • Understanding enhanced greenhouse effect/ trapped longwave radiation • Specific detail of human activities (industry, urban development, deforestation, etc) /gases (global warming potential - GWP) • Natural activities/feedback loops (melting of Arctic ice) Explanation will be in terms of the enhanced greenhouse effect with an increase in greenhouse gases (carbon dioxide, methane, nitrous oxides) in the atmosphere as a result of human activities, such as large-scale farming and burning fossil fuels for power. A greater concentration of greenhouse gases absorbs and traps heat in the atmosphere, leading to increased temperature. Candidates may refer to the feedback loops caused by: • Melting Arctic sea ice (changes in albedo). • Melting of permafrost and the release of methane. • The overall temperature increase leading to more water vapour in the atmosphere, water vapour also being a greenhouse gas. Suggestion for natural processes, such as volcanic action, sunspot activity, cyclical changes in Earth's orbit could also be relevant. **1 mark** for a simple explanation, **2 marks** for a detailed explanation up to the maximum.	**5**

Rocks and weathering

Question	Answer	Marks
3(a)	**Fig. 3.1 shows models of different types of mass movements.** **State the type of mass movement shown in Fig. 3.1 that has the fastest speed under the driest conditions.** Rockfall	**1**
3(b)	**Describe the relationships between the type of mass movement, speed and moisture content shown in Fig. 3.1.** Description could include: • Flows (earth flow, mudflow and debris flow) typically occur in wetter conditions and at faster speeds • Largely the wetter the conditions, the faster the movement • Solifluction and soil creep are the slowest movements • Rockfall, debris flow and mudflow are the fastest movements • Soil creep and rockfall are the movements that occur in the driest conditions • Solifluction, earth flow and mudflow occur in the wettest conditions • Rotational slide (slump) and debris flow are intermediary in terms of moisture but range from slower to faster movements **1 mark** for each description.	**4**
3(c)	**Explain how water influences mass movement.** The main elements are weight, lubrication, cohesion, undercutting. Water infiltrating soils will increase the weight and therefore the downslope component of gravity. It may lubricate any slip plane that might be present and will also increase pore water pressure leading to a reduction in cohesion and strength. After a period of heavy rainfall, moisture can reduce the cohesion of particles on a slope causing a loss in shear strength. This will cause a mudflow or earth flow. With a movement such as solifluction, it is a frozen ground and a saturated surface layer that allows the movement to take place. Water can undercut the base of a slope, such as with a spring, causing an undercutting effect, reducing the strength of the slope and allowing a movement to take place. Weathering and marine erosion are also relevant. Reference to vegetation/water could be relevant. **1 mark** for a simple explanation, **2 marks** for a detailed explanation up to the maximum.	**5**

Section B

Answer **one** question from this section. All questions are worth 30 marks.

Hydrology and fluvial geomorphology

Question	Answer	Marks
4(a)(i)	**Define the fluvial terms *saltation* and *cavitation*.** Saltation is a fluvial transport process (1) where particles bounce along the riverbed (1). Cavitation is a fluvial erosion process (1) caused by the force of air bubbles imploding after being trapped in the bank material (1). Repeated over time, the bank is weakened (1). Maximum **2 marks** for each definition.	**4**
4(a)(ii)	**Briefly explain the process of solution within a river channel.** River water is often slightly acidic (e.g. carbonic acid/organic acid). This will dissolve materials/rocks in the riverbed and banks (e.g. chalk, limestone) with the solute being carried away. Solution is both an erosion and transport process. **1 mark** for a simple explanation, **2 marks** for a detailed explanation up to the maximum.	**3**
4(b)	**Explain the factors influencing stores in a drainage basin system**. The stores in a drainage basin system include interception (vegetation), surface water, soil water, ground water and channel storage. These are all influenced by the nature of the drainage basin, such as: • Soil types • Geology – rock type and structure • Topography • Vegetation • Climate – amount/type of precipitation, temperature for evaporation/ freezing e.g. glaciers and seasonal melting • Human impacts – land use/vegetation cover (deforestation, afforestation, urbanisation), abstraction and reservoirs/dams, etc. All the factors affect the amount of rainfall reaching the ground surface and then infiltrating into the soil. These will need relating to the various stores. Award marks based on the quality of explanation and breadth of the response using the marking levels below. **Level 3 (6–8)** Response clearly explains the factors influencing stores in a drainage basin system. Response is well founded in detailed knowledge and strong conceptual understanding of the topic. Examples used are appropriate and integrated effectively into the response.	**8**

Question	Answer	Marks
4(b)	**Level 2 (3–5)** Response explains the factors influencing stores in a drainage basin system. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response describes the factors influencing stores in a drainage basin system. Knowledge is basic and understanding may be inaccurate. Examples are in name only or lacking entirely. **Level 0 (0)** No creditable response.	
4(c)	**With the aid of examples, assess the view that soft engineering is less effective than hard engineering in reducing river flooding.** Soft engineering strategies include floodplain and drainage basin management, wetland and riverbank conservation and river restoration, and these will need to be discussed and evaluated in terms of their efficiency in preventing river flooding. It might be argued that such strategies could stop minor flooding but have little effect on severe flooding and therefore impacts. Drainage basin management might reduce some overland flow but may have little effect on high intensity rainfall especially if soils, rock types and topography hinder infiltration. Hard engineering strategies, such as levees and drainage spillways, might appear better at preventing flooding but have long term economic and environmental costs. Candidates may conclude in different parts of the same river various soft engineering and hard engineering approaches are both beneficial to an overall outcome of reducing river flooding. Some soft engineering approaches do in fact work by encouraging the river to flood but in what is deemed to be appropriate places. Award marks based on the quality of the response using the marking levels below. **Level 4 (12–15)** Response thoroughly assesses the view that soft engineering is less effective than hard engineering in reducing river flooding. Examples used are appropriate and integrated effectively into the response. Response is well founded in detailed knowledge and strong conceptual understanding of the topic. **Level 3 (8–11)** Response assesses the view that soft engineering is less effective than hard engineering in reducing river flooding but may be unbalanced. Examples may lack detail or development. Response develops on a largely secure base of knowledge and understanding. **Level 2 (4–7)** Response shows general knowledge and understanding of the view that soft engineering is less effective than hard engineering in reducing river flooding.	**15**

Question	Answer	Marks
4(c)	Response is mainly descriptive or explanatory with limited use of examples and understanding of the topic may be partial or inaccurate. Some concluding remarks. General responses without the use of example(s) will not get above the middle of Level 2 (6 marks). **Level 1 (1–3)** Response may broadly discuss the view that soft engineering is less effective than hard engineering in reducing river flooding but does not address the question and does not come to a convincing conclusion. Response is descriptive, knowledge is basic and understanding is poor. **Level 0 (0)** No creditable response.	

Atmosphere and weather

Question	Answer	Marks
5(a)(i)	**State <u>three</u> characteristics of wind belts.** Some characteristics may include: • Wind belts are winds that blow in a consistent direction • For a long distance • For a long period of time • Over a wide area • From high to low pressure areas/ general patterns of atmospheric movement of air The trade winds blowing towards the equator in tropical zones from an easterly direction, the prevailing westerlies in mid-latitudes, and the polar easterlies. As these wind belts move north or south they are deflected as a result of the Coriolis force. Reference to jet streams/Rossby waves can also gain credit. **1 mark** for each characteristic.	**3**
5(a)(ii)	**Explain how ocean currents contribute to the global atmospheric transfer of energy.** Warm ocean currents transfer heat from the Equator to the poles and cold ocean currents transfer heat in the opposite direction maintaining a balance in the transfer of energy. Winds passing over the currents also take on the characteristics of the currents and aid in the transference of energy. Reference to the great ocean conveyor belt can gain credit. **1 mark** for a simple explanation, **2 marks** for a detailed explanation up to the maximum.	**4**

Question	Answer	Marks
5(b)	**Describe and explain the main factors that affect the diurnal energy budget.** There are six components to the daytime energy budget: • Incoming short wave solar radiation – influenced by cloud cover and latitude • Reflected solar radiation – the nature of the ground surface (albedo) • Surface absorption – affected by the nature of surface and how well it can conduct heat. If heat is not carried away it will remain concentrated at the surface • Sensible heat transfer removes energy from the surface and passing it to the air (convective transfer) • Long wave radiation emitted by surfaces, passes into, then out of the atmosphere • Latent heat transfer – when water is on the surface, some of the incoming radiation is used to evaporate it so cannot raise local temperature The night-time energy budget comprises: • Longwave outgoing radiation as nights are often cloudless especially in high pressure zones • Sensible heat transfer: cold air moving in can reduce temperatures/warm air increases them • Latent heat transfer as water vapour near the cold surface can condense to form dew, releasing latent heat • Absorbed energy returned to Earth These components will be affected by cloudiness, greenhouse gases, aerosols, nature of the ground surface (albedo) and climatic characteristics. Award marks based on the quality of explanation and breadth of the response using the marking levels below. **Level 3 (6–8)** Response clearly describes and explains the main factors that affect the diurnal energy budget. 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 describes and explains the main factors that affect the diurnal energy budget. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response describes the main factors that affect the diurnal energy budget. Knowledge is basic and understanding may be inaccurate. Examples are in name only or lacking entirely. **Level 0 (0)** No creditable response.	**8**

Question	Answer	Marks
5(c)	**With the aid of examples, how far do you agree that convection is the main cause of precipitation?** The main causes of precipitation are convection, frontal uplift and the orographic/relief effect. All three mechanisms will need discussing and evaluating to provide an argument with respect to the question. Much of the evaluation may be in terms of location. For example: • Convectional uplift associated with high temperatures in low latitudes/urban heat islands/ seasonality • Orographic uplift associated with mountainous terrain • Frontal uplift associated with mid latitude depressions. Reference to the causes of monsoonal precipitation can gain credit. Award marks based on the quality of the response using the marking levels below. **Level 4 (12–15)** Response thoroughly assesses how far they agree that convection is the main cause of precipitation. Examples used are appropriate and integrated effectively into the response. Response is well founded in detailed knowledge and strong conceptual understanding of the topic. **Level 3 (8–11)** Response assesses how far they agree that convection is the main cause of precipitation but may be unbalanced. Examples may lack detail or development. Response develops on a largely secure base of knowledge and understanding. **Level 2 (4–7)** Response shows general knowledge and understanding of how far they agree that convection is the main cause of precipitation. Response is mainly descriptive or explanatory with limited use of examples and understanding of the topic may be partial or inaccurate. Some concluding remarks. General responses without the use of example(s) will not get above the middle of Level 2 (6 marks). **Level 1 (1–3)** Response may broadly discuss how far they agree that convection is the main cause of precipitation but does not address the question and does not come to a convincing conclusion. Response is descriptive, knowledge is basic and understanding is poor. **Level 0 (0)** No creditable response.	**15**

Rocks and weathering

Question	Answer	Marks
6(a)(i)	**Describe the process of rainsplash on slopes.** Descriptions may include the following: Rainsplash is where high energy raindrops (1) dislodge soil particles from the surface of the slope (1). The particles move downslope (1) under the influence of gravity. (1)	**3**
6(a)(ii)	**Explain how netting helps to reduce mass movement on slopes.** Bare rock slopes are covered with, usually steel netting, to prevent loose material from falling off the slope. This usually protects the slope from rockfalls on very steep slopes by: • Reducing exposure to physical weathering • Artificially increasing shear strength of slope by holding material together • Wire mesh allowing vegetation to grow through – this further helps support slope stability • Stabilising the slope sufficiently so that other techniques (eg bolting) **1 mark** for a simple explanation, **2 marks** for a detailed explanation up to the maximum.	**4**

Question	Answer	Marks
6(b)	**Explain how the Peltier diagram can be used to study the effect of climate on weathering processes.** The Peltier diagram summarises the relationship between the nature and intensity of weathering processes and average temperature and precipitation amounts. To that effect it can be used to assess the dominant weathering processes in any climatic environment. For example: • High temperature and high rainfall, there is likely to be strong chemical weathering, such as hydrolysis • Low temperatures and low rainfall would suggest that physical weathering may be in operation but not extensively • Candidates may mention different climate zones e.g. tropical, desert, etc. and relate to the weathering experienced there • Candidates may give details on specific weathering processes Limitations are relevant: the Peltier diagram does not consider diurnal temperature variations or seasonality, only mean annual temperature. Award marks based on the quality of explanation and breadth of the response using the marking levels below. **Level 3 (6–8)** Response clearly explains how the Peltier diagram can be used to study the effect of climate on weathering processes. 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 how the Peltier diagram can be used to study the effect of climate on weathering processes. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response describes how the Peltier diagram can be used to study the effect of climate on weathering processes. Knowledge is basic and understanding may be inaccurate. Examples are in name only or lacking entirely. **Level 0 (0)** No creditable response.	**8**

Question	Answer	Marks
6(c)	**Assess the extent to which fold mountains are the main landforms associated with convergent plate boundaries.** Convergent plate boundaries can be either destructive or collision. Both produce fold mountains. However, there is no subduction at collision plate boundaries thus fold mountains are the only major landform that is related to collision. At destructive plate boundaries, ocean trenches and volcanoes are landforms that are formed, in addition to fold mountains, because of subduction. The various processes and landforms will need evaluating. • Oceanic-continental subduction – leads to formation of ocean trench, continental crust lifts and buckles creating fold mountains. Rising magma creates volcanoes. • Oceanic-oceanic – subduction, trench, formation of volcanic island arcs. • Continental-continental – typically no subduction so only fold mountains are created. • Accretionary wedges Award marks based on the quality of the response using the marking levels below. **Level 4 (12–15)** Response thoroughly assesses the extent to which fold mountains are the main landforms associated with convergent plate boundaries. Examples used are appropriate and integrated effectively into the response. Response is well founded in detailed knowledge and strong conceptual understanding of the topic. **Level 3 (8–11)** Response assesses the extent to which fold mountains are the main landforms associated with convergent plate boundaries but may be unbalanced. Examples may lack detail or development. Response develops on a largely secure base of knowledge and understanding. **Level 2 (4–7)** Response shows general knowledge and understanding of the extent to which fold mountains are the main landforms associated with convergent plate boundaries. Response is mainly descriptive or explanatory with limited use of examples and understanding of the topic may be partial or inaccurate. Some concluding remarks. General responses without the use of example(s) will not get above the middle of Level 2 (6 marks). **Level 1 (1–3)** Response may broadly discuss the extent to which fold mountains are the main landforms associated with convergent plate boundaries but does not address the question and does not come to a convincing conclusion. Response is descriptive, knowledge is basic and understanding is poor. **Level 0 (0)** No creditable response.	**15**