Cambridge Assessment International Education

Cambridge International AS & A Level

GEOGRAPHY **9696/12**

Paper 1 Core Physical Geography **May/June 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 May/June 2023 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

[Turn over

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.

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)
	Level 4	Levels-marked questions only: Section B part (c)
	Level 3	Levels-marked questions only: Section B parts (b) and (c)
	Level 2	Levels-marked questions only: Section B parts (b) and (c)
	Level 1	Levels-marked questions only: Section B parts (b) and (c)
	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)
	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
	Developed point	All questions
	Appropriate example or case study given	All questions
	Irrelevant	All questions
	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.  or 	Levels-marked questions only: Section B parts (b) and (c)

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)

Section A

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

Hydrology and fluvial geomorphology

Question	Answer	Marks
1(a)(i)	**Fig. 1.1 shows the Hjulström curve.** **Name the type of sediment which is eroded at a velocity of 20 cm/s shown in Fig. 1.1.** Sand	**1**
1(a)(ii)	**State the maximum velocity for gravel to be deposited shown in Fig. 1.1.** 35–45 cm/s (units required)	**1**
1(b)	**Describe the variations in velocity of flow for transport and deposition shown in Fig. 1.1.** • The velocity required to transport sediment is always higher than that required to deposit sediment. • For clay, the velocity to transport sediment can be less than 0.1 cm/s, as very little velocity is needed once the sediment is entrained. • At higher velocities, larger sediments are deposited whilst the smaller sediments are transported. • Variations in velocity of flow could be taken to mean variations horizontally across the graph, or variations for transportation and deposition of different sediment types at any point on the x-axis. Reserve **1 mark** for use of data. Both transport and deposition need to be considered for full marks.	**4**
1(c)	**Using Fig. 1.1, explain the relationship between velocity of flow and the erosion of different types of sediment.** • Sediment of sizes greater than 0.1 mm have a clear relationship – higher velocities are needed to erode larger sediment because of their increased weight. • Clay requires a higher velocity for erosion. This is because of the cohesive nature of clay/higher velocities are needed to separate and entrain individual clay particles. • Credit relevant explanatory examples from diagram e.g. gravel (2 mm) requires at least 50 cm/s to be eroded. Cobbles (100 mm) requires 300/400 cm/s to be eroded. **1 mark** for each explanation, **2 marks** for a detailed explanation, up to the maximum. **Max. 3** if no reference to data in Fig. 1.1.	**4**

Atmosphere and weather

Question	Answer	Marks
2(a)	**Fig. 2.1 shows average annual precipitation for Lima and the surrounding area, Peru.** **State the average annual precipitation shown at A on Fig. 2.1.** 170–335 mm (units required). Accept any figure within this interval.	**1**
2(b)	**Describe the pattern of rainfall shown in Fig. 2.1.** Description could include: • Increasing rainfall from west to east/north-east (or linear pattern from north-west to south-east) • Lowest annual totals near coastline/to the west • Highest annual totals in north-east/east • Lower amounts of annual average rainfall in river valleys (in centre/east) Allow **1 mark** for data from map.	**4**
2(c)	**Suggest reasons for the pattern of rainfall such as that shown in Fig. 2.1.** Explanation should be the focus. • Coast. Low rainfall/lack of vertical uplift. • Limited evaporation from cold ocean (current). • Inland. High rainfall/possible orographic uplift of moist air. • Possible increased convectional activity inland. • Wind patterns • Anomalies/patterns shown due to specific topography (e.g. valleys) **1 mark** for each point, **2 marks** for each developed point, up to the maximum.	**5**

Rocks and weathering

Question	Answer	Marks
3(a)	**Fig. 3.1 is a photograph which shows a mass movement.** **Name the type of mass movement shown in Fig. 3.1.** Rockslide/landslide/slide/landslip	**1**

Question	Answer	Marks
3(b)	**Draw a sketch of the mass movement shown in Fig. 3.1. Label the main features.** Features to include: • Scree/Debris slope/deposited material/disintegrated material etc. • Scar • Slip plane/slide plane/bare rock face/failure surface • Toe The diagram should **not** be an idealised/theoretical rockslide. **2 marks** for the diagram. **2 marks** for two correct labels. No credit for features not shown in the photograph.	**4**
3(c)	**Explain the causes of the type of mass movement such as that shown in Fig. 3.1.** Explanations could include discussion of: • Water (reduces friction)/weight • Rock type/structure • Steepness of slope/gravity • Lack of vegetation • Earthquake • Erosion at the base • Weathering • Human activities **1 mark** for each 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)	**Describe the main features of a meander.** Descriptions could include: • River cliff formed by erosion on one side • Point bar/slip-off slope formed by deposition on the other side • Asymmetrical cross-section • Zone of fast flowing water – thalweg • Winding shape/sinuosity • Helicoidal flow/corkscrewing • Pools/riffles **1 mark** for each descriptive point. Credit the use of an annotated diagram.	**3**
4(a)(ii)	**Explain <u>two</u> factors which influence the level of a water table.** • Increased rainfall/lack of rainfall • Evaporation/evapotranspiration • Water abstraction • Nature of the bedrock (percolation, porosity etc.) • Slope gradient • Vegetation (infiltration, interception etc.) • Antecedent moisture Answers should include a description of factors, with **1 mark** for the identification of the factor and **1 mark** for the development.	**4**

Question	Answer	Marks
4(b)	**Describe and explain the formation of deltas.** A description and explanation of deltas could include: • Distributaries/braided streams • Shape (e.g. bird's foot/cuspate/arcuate) • Deposition • Eyots • Topset/foreset/bottomset beds • Sorting of sediment • Flocculation of clay • Offshore currents and wave action The explanation will be in terms of the river flowing into a body of water which is of a lower velocity (e.g. lake/sea), reducing the capacity of the river. Credit well annotated diagrams. 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 formation of deltas. 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 formation of deltas. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response describes some features of a delta. 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
4(c)	**With the aid of examples, assess the extent to which different land-use changes affect channel flows.** 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. An awareness that land-use change can result in either increase or decrease in channel flow. For example, land-use change from permeable to impermeable surfaces results in increased runoff, and this increases channel flow. On the other hand, an area becoming afforested increases vegetation interception, uptake by roots etc., thus the volume of flow reaching the channel decreases. Other topics for discussion which may affect land-use change and channel flows might include: changes in farming practice, urbanisation, deforestation, dam construction, creation of wetlands etc. Factors such as intensity of rain are also important and could form part of the assessment. Award marks based on the quality of the response using the marking levels below. **Level 4 (12–15)** Response thoroughly discusses the extent to which different land-use changes affect channel flows. 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 discusses the extent to which different land-use changes affect channel flows 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 land-use changes which result in changes to channel flow. 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 land-use changes which result in changes to channel flow 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**

Atmosphere and weather

Question	Answer	Marks
5(a)(i)	**Define the atmospheric terms *evaporation* and *sublimation*.** Evaporation is the change from liquid to gas (1) as a result of air movement and/or heat (1). Sublimation is the change of a solid into a gas (1) without going through the liquid stage or vice-versa (1).	**4**
5(a)(ii)	**Briefly explain the formation of hail.** • Water droplets are moved through the cloud by up draughts and down draughts, growing in size. • Freezing occurs on the water droplets as the temperature falls. • Super cooled water droplets collide with the water droplets (accretion) • Once large enough, they fall and may not melt before reaching the ground. **1 mark** for each explanatory point to the maximum.	**3**

Question	Answer	Marks
5(b)	**Describe and explain the enhanced greenhouse effect.** An increase of greenhouses gases, due to human activity, intensifies the greenhouse effect. The Earth's longwave radiation is either absorbed by the greenhouse gases or re-radiated back to the Earth's surface. Such greenhouse gases include carbon dioxide, methane, nitrous oxides, ozone and CFCs. The candidate may note that the greenhouse effect is naturally occurring. However, an increase in the concentration of greenhouse gases creates additional warming of the atmosphere. Expect discussion of why the greenhouse gases are increasing and how they create rising temperatures. 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 enhanced greenhouse effect. 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 enhanced greenhouse effect. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response describes the enhanced greenhouse effect. 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)	**'Wind belts are the main influence on the global atmospheric transfer of energy.' With the aid of examples, how far do you agree?** 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. Responses should weigh up the effect of wind belts as a transfer of excess energy, but also by ocean currents and the great ocean conveyer belt. They also may classify transfers as being horizontal or vertical. The candidate may support the statement by referring to sub-tropical high-pressure belts and trade winds as well as mid-latitude and polar easterlies. Jet streams and Rossby waves may be discussed. Detailed discussion on concepts such as air masses may be given. The effect of ocean currents would need to be considered, noting that it is also dependent on whether these currents are warm or cold. The argument could be made that ocean currents, such as the gulf stream, are more notable during the winter, and thus the answer may conclude that it is dependent on factors such as seasons and locations. A consideration of factors such as large continental areas or latitude as an influence on pressure and wind systems may also be relevant. Award marks based on the quality of the response using the marking levels below. **Level 4 (12–15)** Response thoroughly discusses the extent to which wind belts are the main influence on the global atmospheric transfer of energy. 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 discusses the extent to which wind belts are the main influence on the global atmospheric transfer of energy 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 wind belts are the main influence on the global atmospheric transfer of energy. 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).	**15**

Question	Answer	Marks
5(c)	**Level 1 (1–3)** Response may broadly discuss the extent to which wind belts are the main influence on the global atmospheric transfer of energy 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.	

Rocks and weathering

Question	Answer	Marks
6(a)(i)	**Describe the processes of sediment movement on a slope.** Processes of sediment movement are through falls, creep (heave, solifluction), flows, rainsplash, slides (slumping) and sheetwash (rills). A basic description is required. Simply naming a process is not sufficient. Credit discussion of gravity movement and the possible role of water on slopes. Diagrams can be given credit where they serve to help describe the sediment movement on a slope. At least two processes are needed.	**3**
6(a)(ii)	**Explain how modifying a slope with pinning and netting could reduce mass movement.** Pinning involves drilling long iron rods into a rock surface, usually perpendicular to the rock face. This adds to the shear strength of the rock, promoting stability and helping to reduce mass movement. It can create anchors for other slope stability methods. Netting, when used on a surface of the slope, helps to contain any debris which is loosened and reduces the ability of falls to happen, as well as sometimes providing a structure for vegetation to attach and help stabilise the slope. **2 marks** each.	**4**

Question	Answer	Marks
6(b)	**Explain how the type and rate of weathering is influenced by temperature.** A key reference that can be used here is the Peltier diagram. In general, the higher the temperature the stronger the degree of chemical weathering. There is a positive relationship between temperature and the rate of chemical weathering, as with every increase of temperature, the rate of chemical reaction increases e.g. (hydration and hydrolysis). The rate of physical weathering is different, as fluctuations around 0°C gives rise to physical weathering such as freeze–thaw. Physical weathering is also present at higher temperatures, but again requires fluctuations in temperature (e.g. exfoliation, granular disintegration). Salt crystallisation is also valid. Reference to other factors such as precipitation and rock type can also be useful here. Temperature needs to be discussed for both chemical and physical weathering for an effective answer. 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 type and rate of weathering is influenced by temperature. 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 type and rate of weathering is influenced by temperature. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response describes and/or explains how the type and/or rate of weathering is influenced by temperature. 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)	**With the aid of examples, assess the extent to which the type of plate boundary determines the plate tectonic landforms present.** 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. Responses may discuss the different types of plate boundaries: divergent (constructive), conservative and convergent (destructive/collision). There are some distinctive plate tectonic landforms which are closely determined by the type of plate boundary. These include sea floor spreading and ocean ridges with divergent plate boundaries, and volcanoes, fold mountains and ocean trenches being dominant with convergent destructive boundaries. Evaluation may conclude that certain landforms such as volcanoes and fold mountains can occur at different types of boundaries, and that some features (hot spots) are not always clearly related to a specific type of boundary. Award marks based on the quality of the response using the marking levels below. **Level 4 (12–15)** Response thoroughly discusses the extent to which the type of plate boundary determines the plate tectonic landforms present. 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 discusses the extent to which the type of plate boundary determines the plate tectonic landforms present 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 the type of plate boundary determines the plate tectonic landforms present. 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 the type of plate boundary determines the plate tectonic landforms present 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**