Cambridge Assessment International Education

Cambridge International AS & A Level

GEOGRAPHY **9696/13**

Paper 1 Core Physical Geography **October/November 2023**

MARK SCHEME

Maximum Mark: 60

Published

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

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

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

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

Generic Marking Principles

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

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

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

GENERIC MARKING PRINCIPLE 2:

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

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

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

GENERIC MARKING PRINCIPLE 4:

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

GENERIC MARKING PRINCIPLE 5:

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

GENERIC MARKING PRINCIPLE 6:

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

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 is a photograph which shows waterfalls in Iceland.** **Name the feature labelled A in Fig. 1.1.** Plunge pool	**1**
1(b)	**Describe the landscape features shown in Fig. 1.1.** The landscape features that could be described are: • Multiple waterfalls • Some waterfalls are in chutes (gorges) • Some waterfalls flow over the edge of a plateau • Multiple plunge pools (air bubbles) • Vertical rock cliffs/ resistant cap rock/ joints/ bedding planes • Flat plateau surface • Residual/ partly submerged rocks (sediments) • Snow covered background • Scrub vegetation/grass on the plateau • Lake/river above the waterfall • Large body of water **1 mark** for each descriptive feature.	**4**
1(c)	**Explain how waterfalls are formed.** The main explanatory points are: • Water spills over a sudden change of gradient, often over the edge of a plateau • Change of gradient is often caused by a resistant rock overlying a less resistant rock/caused by faulting • Rock is undercut by the falling water (plunge pool) • Explanation of processes of hydraulic action, cavitation and abrasion • Collapse of overhanging strata • This leads to a retreat of the waterfall back upstream **1 mark** for each simple explanation, **2 marks** for a developed explanation up to the maximum. Credit the use of well annotated diagram(s).	**5**

Atmosphere and weather

Question	Answer	Marks
2(a)	**Fig. 2.1 shows incoming (shortwave) solar radiation. Fig. 2.2 shows outgoing longwave radiation.** **State the total amount of outgoing longwave radiation shown in Fig. 2.2. Show your working.** 219 Wm^{-2} + 20 Wm^{-2} (398 – 378) (1 mark) = 239 Wm^{-2} (1 mark) Units are needed for full marks.	**2**
2(b)	**Compare the size of the components of the incoming (shortwave) solar radiation shown in Fig. 2.1.** The emphasis is on comparison, thus simply repeating the values is not acceptable. Comparisons could include: • Solar radiation to the surface is greatest (185 W m^{-2}) • Solar radiation absorbed by atmosphere is the next (2nd) largest component (79 W m^{-2}) • Scattered by clouds and atmosphere is the next (3rd) largest (76 W m^{-2}) • Reflected solar radiation from surface is the lowest component (24 W m^{-2}) • Solar radiation to the surface (185 W m^{-2}) is higher than the total reflected solar radiation (24 W m^{-2}) **1 mark** per valid comparison. Use of data for **full marks**.	**4**
2(c)	**Explain how atmospheric conditions and surface conditions affect the components shown in Fig. 2.1.** Atmospheric and surface conditions will reflect and absorb the radiation depending on the nature of those conditions. **Atmospheric conditions** will determine particulate matter, gases and moisture (clouds) and their ability to reflect or absorb energy. **Surface conditions** will determine the albedo of various surfaces (water, ice, vegetation, etc.) and their ability to absorb energy. **1 mark** for each simple explanation, **2 marks** for a developed explanation up to maximum. Reference to both atmospheric and surface conditions is needed for full marks.	**4**

Rocks and weathering

Question	Answer	Marks
3(a)	**Fig. 3.1 shows the global distribution of plate boundaries and subduction zones.** **Name the type of plate boundary labelled Z.** Divergent (constructive)	**1**
3(b)	**Describe the global distribution of subduction zones shown in Fig. 3.1.** The main descriptive points are: • Around the Pacific Ring of Fire • Found where plates converge/not found where plates diverge • Continuous down the eastern coastline of East Asia on the boundary of the Pacific Plate • Small zone along the north-west coast of North America • Along the western coast of South America at the junction of the Nazca Plate and the South American Plate • Small zone on the north edge of the African Plate/north edge of the Arabian Plate, etc. **1 mark** for each description.	**4**
3(c)	**Explain how volcanic island arcs are formed.** The main points are: • Convergent of two oceanic plates • Driven by convection currents in the mantle • Subduction of the denser of the two plates • Melting of the subducting plate at the Benioff zone • Rise of magma through the non-subducting plate • To produce volcanic islands **1 mark** for each simple explanation, **2 marks** for a developed 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 process of base flow in the drainage basin system.** Base flow is the: • Flow of water below the water table (groundwater flow) • Towards the river channel • A result of water percolating through the soil and bedrock from the surface • A relatively constant/slow flow compared to surface flow **1 mark** for each description.	**3**
4(a)(ii)	**Briefly explain how the porosity and permeability of soils affect infiltration.** Porosity: the ability of soils to absorb moisture Permeability: the ability of soils to transmit moisture Permeability is most closely related to infiltration. E.g. Both clay and sand may be porous but only sand with interconnected pore spaces would be permeable leading to infiltration. Reference to both porosity and permeability is needed for full marks.	**4**

Question	Answer	Marks
4(b)	**Describe and explain the factors that affect the shape of an annual hydrograph.** River regimes are affected by factors that occur through the year, which vary the amount of water reaching the river and are not permanent features of the drainage basin. Thus, the main factors are rainfall distribution throughout the year with the possibility of snow melt in the spring, growth of leaves on deciduous trees reducing volume of water reaching the ground, annual vegetation growth increasing evapotranspiration, and seasonal land use practices which will affect the flows and stores in the drainage basin. There are others that could be mentioned, such as urbanisation, irrigation, drought, summer thunderstorms, etc. 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 factors that affect the shape of an annual hydrograph. 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 factors that affect the shape of an annual hydrograph. 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 that affect the shape of an annual hydrograph. 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)	**'River floods cannot be prevented but their impacts can be reduced.'** **With the aid of one or more examples, how far do you agree with this statement?** Answers could argue that it is very difficult to prevent river flooding if the rainfall amounts are large. Thus, answers will probably focus on the various ways of reducing impacts: • Hard engineering which could include: dams, embankments, straightening, retention basins, flood relief channels, etc. • Soft engineering which could include: zoning, afforestation, river restoration, conservation, etc. • Insurance • Evacuation • Prediction/warnings/flood risk maps • Understanding causal factors such as urbanisation, climate change, deforestation, etc. Award marks based on the quality of the response using the marking levels below. **Level 4 (12–15)** Response thoroughly assesses the statement that river floods cannot be prevented but their impacts can be reduced. 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 statement that river floods cannot be prevented but their impacts can be reduced, but it 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 statement that river floods cannot be prevented but their impacts can be reduced. 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 statement that river floods cannot be prevented but their impacts can be reduced, 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 *sublimation* and *clouds*.** Sublimation is the transfer of a substance from solid to gas (or vice versa) (1) without going through the liquid state (direct) (1). Clouds are an aerosol consisting of a visible mass of tiny liquid droplets or frozen ice crystals (1) suspended in the air/atmosphere (1).	**4**
5(a)(ii)	**Briefly explain latent heat transfer.** Latent heat transfer is the release of heat into the atmosphere (1) as rising air condenses (1) after being cooled to dew point (1). A phase change without temperature change (1). Also credit an explanation of latent heat of vaporisation/evaporation up to full marks. **1 mark** for each point.	**3**
5(b)	**Explain how latitude affects the seasonal variation in global wind belts.** As winds blow from high to low pressure areas, global wind belts are related to variations in global pressure. One of the main influences on pressure is temperature, thus the position of the overhead sun which varies throughout the year with latitude is critical. Thus the tropics have low pressure because of rising air but this zone moves north and south with the overhead sun. It is likely that candidates will focus on global wind patterns relating to Hadley, Ferrel and Polar cells and their seasonal pattern changes, together with a consideration of monsoon systems and land-sea distribution more generally. 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 latitude affects the seasonal variation in global wind belts. 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 latitude affects the seasonal variation in global wind belts. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response describes how latitude affects the seasonal variation in global wind belts. 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 with the view that precipitation is mainly caused by uplift of air?** The types of precipitation listed in the syllabus are clouds, rain, hail, snow, dew and fog. The formation of these types varies. Rainfall requires the uplift of air followed by condensation before clouds and rainfall can occur. But there are different uplift mechanisms for orographic, convection and frontal rainfall. Hail requires down draughts and up draughts of air. Dew does not require uplift of air but radiation loss on surfaces leading to condensation. Radiation fog requires radiation loss at low levels leading to condensation. Advection fog is formed when warm air passes over a cold surface. Frontal fog can occur when warm air meets cold air at a front. There is a certain amount of uplift in this mechanism. Hill fog occurs when warm air is forced to rise up a slope and cools, thus there is some uplift with this process. These conditions need assessing in order to answer the question. Award marks based on the quality of the response using the marking levels below. **Level 4 (12–15)** Response thoroughly assesses the view that precipitation is mainly caused by uplift of air. 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 precipitation is mainly caused by uplift of air 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 precipitation is mainly caused by uplift of air. 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 precipitation is mainly caused by uplift of air 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)	**Define the mass movement terms *heaves* and *falls*.** Heaves are the upward movements of soil particles at the surface (1) at right angles/ vertically/ perpendicular to/ parallel to the slope (1) Falls are the sudden movement, usually of rock (1) from a vertical or steeply inclined rock face (1). Mark 2+2	**4**
6(a)(ii)	**Briefly explain how rocks can be weathered by freeze–thaw action.** Water enters rock joints and pores, freezes and expands (1) and puts pressure on the rock (1). Repetition of the process might lead to rock failure (1). **1 mark** for each point.	**3**
6(b)	**Explain how human activity may increase the stability of slopes.** The syllabus lists pinning, netting, grading and afforestation as strategies to reduce mass movements and thus increase stability. Detailed consideration of the above could allow candidates to reach Level 3. However, there are others that could be mentioned such as shotcrete, slope drainage, reinforcing slope base with gabions, removal of buildings, terracing, contour ploughing, crop rotation, etc. 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 human activity may increase the stability of slopes. 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 human activity may increase the stability of slopes. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response describes how human activity may increase the stability of slopes. 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)	**'Rock type and rock structure are the most important factors in affecting the type of weathering.'** **With the aid of examples, how far do you agree with this statement?** **Rock types** may include the mineralogy of sandstone, limestone, granite, etc. in relation to weathering processes. **Rock structure** may consider bedding planes, joints, etc. in relation to porosity and permeability. These factors will need to be part of the evaluation with respect to a range of physical, chemical, biological weathering processes. Human activity, climate, vegetation, relief and other factors may also be discussed as part of the evaluation. Award marks based on the quality of the response using the marking levels below. **Level 4 (12–15)** Response thoroughly assesses the statement that rock type and rock structure are the most important factors in affecting the type of weathering. 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 statement that rock type and rock structure are the most important factors in affecting the type of weathering 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 statement that rock type and rock structure are the most important factors in affecting the type of weathering. 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 statement that rock type and rock structure are the most important factors in affecting the type of weathering 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**