CAMBRIDGE
International Education

Cambridge International AS & A Level

GEOGRAPHY **9696/12**

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.

This document consists of **17** printed pages.

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 mean annual hydrographs of the Niger River, at Niamey, Niger.** **State the highest discharge shown in Fig. 1.1.** 1675–1700 cumecs (must have units)	**1**
1(b)	**Compare the mean annual hydrograph for 1971–1990 with the mean annual hydrograph for 2011–2020.** The main points are: • 1971–1990 has a broad peak rising in August and peaking in December whereas 2011–2020 has a sharp peak in September followed by a sharp fall • 1971–1990 has a single peak whereas 2011–2020 has two peaks • 2011–2020 has a higher peak discharge • 2011–2020 has a higher overall discharge • 2011–2020 has a steeper initial increase • 2011–2020 has jagged increase/fluctuations between July and August whereas 1971–1990 has a smooth rising limb • Both have rapid rises and rapid decreases • Both have peaks in December/January **1 mark** for each comparison. **Max. 3** if only differences or similarities. **Max. 2** if separate descriptions with no attempt at comparison. **Max. 3** if no use of data	**4**

Question	Answer	Marks
1(c)	**Explain why annual hydrographs might vary from year to year.** Variations in annual hydrographs reflect transient changes in the drainage basin. While rock type, soils and topography are relatively constant, factors that could lead to variations in runoff, and thus change in discharge throughout the year, may include: • Increase or decrease in temperature – hotter summer leading to increased evaporation, melting of snow, affecting runoff leading to an increase or decrease of runoff amounts and therefore changes in discharge. • Precipitation varying from one year to the next– amount and intensity (e.g. saturated soils due to prolonged wet periods, periods of drought) • Land use changes (agriculture use, deforestation, urbanisation) affecting runoff and therefore discharge • Human management strategies, e.g. control and release of water via dams, water abstraction No marks for a simple identification of factors, there needs to be a subsequent development. **1 mark** for a simple explanation, **2 marks** for a developed explanation, 3 marks for a well-developed explanation.	**5**

Atmosphere and weather

Question	Answer	Marks
2(a)	**Fig. 2.1 shows the predicted change in annual number of mild days from the 1986–2005 average to the average predicted for the period 2081–2100.** **State the predicted change in the number of mild days for location X shown in Fig. 2.1.** –25 to –50 / –25 to –50 (not just –25)	**1**
2(b)	**Describe the pattern of predicted change in the number of mild days shown in Fig. 2.1.** Description could include: • The tropics show the biggest decline in the number of mild days • The area between the Equator and Tropic of Capricorn has fewer mild days than that between the Equator and Tropic of Cancer • Northern hemisphere shows little change in the number of mild days • Areas of the biggest increase in the number of mild days are in mid-latitudes/north and south of the two tropics. • Description of pattern of relationships with topography such as mountain areas • Patterns of more/fewer mild days are relevant **1 mark** for each description. **Reserve one mark** for use of data.	**4**
2(c)	**Explain the enhanced greenhouse effect.** The greenhouse effect is: • The effect of a named greenhouse gas such as carbon dioxide, methane, nitrous oxides and water vapour • Which (allows incoming shortwave radiation) but absorbs outgoing longwave radiation • Leading to increased atmospheric temperatures The enhanced greenhouse effect is: • The increase in the amount of these gases • As a result of industrial processes and/or other named human activities that increase the amounts of these gases. Answers should explain the effect and comment on the processes, industrial and agricultural, that have led to the increase. **Max. 3** if no discussion of enhanced effect. **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 a model of a mass movement.** **State the type of mass movement shown in Fig. 3.1.** (Rotational) landslide/(slump), any reference to slide or slip is acceptable	**1**
3(b)	**Describe the features of the mass movement shown in Fig. 3.1.** The main features which could be described are: • Steep upper scar/scarp • Multiple rotational slip planes throughout the failure • Several upper slumped masses/terraces • Toe lobe • Transverse cracks throughout the slipped mass • Irregular surface of rupture • Increase in slope gradient at top but decrease at the bottom • Bowl-shaped/concave feature **1 mark** for each description. Credit the use of a descriptive annotated diagram. It must be a description not merely stating features.	**4**
3(c)	**Explain how the mass movement process of heave may occur.** Soil heave can occur by either: • Wetting and drying • Freezing and thawing • Soils expand when wet and contract on drying. • During cold temperatures, small ice crystals (pipkrakes) form in wet soil leading to expansion, with contraction on thawing • Soils expand on freezing and contract on melting • Further credit for the effect of repeated cycles of expansion and contraction • In both cases, the soil is lifted upwards and falls back generally in a downslope direction. • Explanation of heating and cooling processes is relevant. **1 mark** for a simple explanation, **2 marks** for a developed explanation, **3 marks** for a well-developed explanation	**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 braided river channel.** The main features are: • Many separate channels • Eyots (islands), some vegetated • Wide/flat, shallow main channel • Vertical banks • Visible sediment in the channels (bars) **1 mark** for each descriptive point. Credit the use of well-annotated diagrams	**3**
4(a)(ii)	**Explain <u>two</u> processes of erosion in a river channel**. The main processes of erosion are abrasion, corrasion, solution, cavitation, attrition and hydraulic action. Two of these need to be explained with velocity, discharge and sediment size featuring prominently: Abrasion/corrasion/rock particles are dragged along the riverbed/riverbanks – If particles carried in the water are larger and stronger than the bed or banks, erosion is more rapid. Small particles smooth the surface. During storm flow more abrasion occurs as sediment load is higher. Some candidates might describe corrasion as rock particles are thrown against the riverbanks causing erosion. Attrition/repeated collision – reduction of size (rounding of load). Solution/ acids in the water dissolves rock – such as limestone/chalk and it is carried away in solution. Cavitation/ water traps air in pores and cracks in the riverbanks – this creates pressure that might be explosively released that weakens the bank material over time. Hydraulic action/ the force of the water – removes rock particles from the riverbed and riverbanks. This is strongest where the water has high turbulence and high velocity e.g. at waterfall plunge pools. **1 mark** for a simple explanation or correct name of an erosion process, **2 marks** for a developed explanation, **3 marks** for a well-developed explanation. Mark 2/2 or 3/1	**4**

Question	Answer	Marks
4(b)	**Explain the formation of river cliffs and point bars.** Both features are related to the development of meanders with pools and riffles and helicoidal flow. River cliffs: • Formed on the outside of meanders • Where the velocity and energy are greatest with the thalweg swinging towards the banks • Erosion of the banks by hydraulic action and cavitation • Lead to further development of the river cliff Point bars: • Formed on the inside of meandering channels • Where the velocity of the river is slowest because of low energy and friction • Leading to deposition of essentially fine-grained sediment • As a low angle point bar or slip off slope Much of the explanation for both landforms can be provided in 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 explains the formation of river cliffs and point bars. 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 the formation of river cliffs and point bars. 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 river cliffs and point bars. 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 land use changes affect water flows above ground and below ground.** The question concerns how land use affects the operation of the drainage basin hydrological system. Water flows above ground: throughfall, stemflow, overland flow, and channel flow. Water flows below ground: infiltration, percolation, throughflow, groundwater, baseflow. Land use changes are likely to include: • Urbanisation – increased impermeable surfaces, reduction in vegetation, leading to greater overland flow • Human management e.g. drains will lead to increased channel flow • Changes in forest cover due to deforestation or tree planting, affecting interception and therefore overland flow, as well as throughfall and stemflow • Changes in agricultural land use e.g. types of crops, livestock compacting soil affecting infiltration, ploughing on slopes Candidates may conclude that land use changes affect surface flows which then have an impact on flows below the ground. Evaluation of the comparative extent to which other factors such as precipitation and drainage basin characteristics affect the flows is potentially relevant. 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 land use changes affect water flows above ground and below ground. 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 land use changes affect water flows above ground and below ground 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 land use changes affect water flows above ground and below ground. 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
4(c)	**Level 1 (1–3)** Response may broadly discuss the extent to which land use changes affect water flows above ground and below ground 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)	**Define the atmospheric terms *sensible heat transfer* and *evaporation*.** Sensible heat transfer is the movement of heat from warmer to colder objects (1) by conduction/convection (1) when they are in direct contact (1), the heat that can be felt (1). Evaporation is the transformation of water into gas (water vapour) (1) through the application of heat (1).	**4**
5(a)(ii)	**Briefly explain how frontal uplift of air may result in precipitation.** Frontal uplift occurs: • when warm air is forced to rise over cold air • Leading to temperature drop and • Condensation and then precipitation. • At a warm front cold air undercuts the warm air/ at a cold front warm air overrides the cold air. **1 mark** for each point.	**3**

Question	Answer	Marks
5(b)	**Describe and explain the latitudinal pattern of radiation in the global energy budget.** Incoming shortwave radiation is greatest at the equator, decreases as you move towards the poles and is lowest at 85°S. Outgoing longwave radiation shows a similar, but less extreme, pattern. Outgoing longwave radiation becomes greater than incoming shortwave radiation at about 45° N and S. The pattern reflects the apparent movement north and south of the overhead sun. Also, because of the curvature of the earth, the incoming shortwave solar radiation comes in at steeper angle at low latitudes and at a shallower angle at higher latitudes which means it is more dispersed in higher latitudes as it has to pass through more atmosphere resulting in scattering and lower levels of solar radiation reaching the Earth's surface. Radiation in higher latitudes is also dispersed over a wider area. The albedo of snow and ice at high latitudes means that much incoming (shortwave) is reflected and not absorbed. 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 latitudinal pattern of radiation in the global 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 latitudinal pattern of radiation in the global 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 latitudinal pattern of radiation in the global 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)	**'Land/sea distribution is the main factor influencing seasonal variations in temperature.'** **With the aid of examples, how far do you agree with this statement?** Differential heating and cooling of land and sea between winter and summer influences seasonal variations in temperature. However, seasonal variations are also influenced by latitude and ocean currents. The various other factors, such as the movement of the overhead sun, ocean currents and wind systems. will need to be evaluated. 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 land/sea distribution is the main factor influencing seasonal variations in temperature. 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 land/sea distribution is the main factor influencing seasonal variations in temperature 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 land/sea distribution is the main factor influencing seasonal variations in temperature. 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 land/sea distribution is the main factor influencing seasonal variations in temperature 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 subduction**. Subduction is the process occurring at convergent plate boundaries (1) where the oceanic crust is forced downwards (1), under a continental plate or another oceanic plate (1) due to convection currents/slab pull (1) and is melted in the subduction (Benioff) zone (1).	**3**
6(a)(ii)	**Explain the weathering process of carbonation**. Carbonation involves the dissolving of carbon dioxide in (rain)water (1) to form carbonic acid (1) followed by the carbonic acid reacting with calcium carbonate in carbonate rich rocks (chalk, limestone) (1) to form soluble calcium bicarbonate (1) which is removed in solution (1).	**4**
6(b)	**Examine the factors that influence sheetwash and rills on slopes**. Both sheetwash and rills represent the movement of water on slopes. During a precipitation event, amount and intensity are important factors. Infiltration capacity needs to be exceeded leading to overland flow. Infiltration capacity is governed by soil characteristics such as permeability, vegetation cover and type and antecedent rainfall amounts. Gradient of the slopes is also an important factor with steeper slopes likely to increase both processes. Sheetwash is the movement of water uniformly over the surface. This usually requires a relatively uniform surface and a large volume of water. Minor irregularities will lead to the water flow concentrated into thin threads which cause minor erosion to form rills. Award marks based on the quality of explanation and breadth of the response using the marking levels below. **Level 3 (6–8)** Response clearly examines the factors that influence sheetwash and rills on 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 examines the factors that influence sheetwash and rills on slopes. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response describes sheetwash and rills on 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)	**With the aid of a case study, assess the extent to which human activity has increased the stability of slopes.** There will be a discussion, with respect to a specific case study, how the stability of slopes, the relationship between shear strength and shear stress, depends on the effects of the various types of mass movement. This will indicate the specific techniques needed to reduce the instability and increase its stability of slopes. Methods may include pinning, afforestation, netting, or grading. Attempts to drain the slope or other ways to stabilise the slope will depend on the case study chosen. Some evidence of evaluative criteria with respect to factors that can hinder the successful attempts at increasing slope stability or where human activity has increased slope instability is necessary for higher level marks. Award marks based on the quality of the response using the marking levels below. **Level 4 (12–15)** Response thoroughly assesses with the aid of a case study the extent to which human activity has increased the stability of slopes. 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 with the aid of a case study the extent to which human activity has increased the stability of slopes 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 with the aid of a case study of the extent to which human activity has increased the stability of slopes. 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 human activity increases the stability of slopes 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**