Cambridge Assessment International Education

Cambridge International AS & A Level

GEOGRAPHY **9696/12**

Paper 1 Core Physical Geography **October/November 2022**

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 2022 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)

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 a river in Iceland.** **Name the type of river channel shown in Fig. 1.1.** Braided.	**1**
1(b)	**Identify the features labelled X, Y and Z as shown in Fig. 1.1.** X is a floodplain, accept vegetation/vegetated. Y is an island, eyot, ait or bar. Z is a river/channel/stream. Not meander on its own. 1 mark for each correct identification.	**3**
1(c)	**Explain how features X, Y and Z may have formed.** A braided river with features X, Y and Z has the following characteristics: General characteristics that can be used to explain all the features: • Fluctuating discharges from high to low • High sediment load, generally coarse-grained, carried at times of high discharge • Highly erodible channel banks • Relatively steep channel gradient Explanation related to individual features: • High discharge, overbank for feature X plus growth of vegetation • Deposition at times of low discharge (e.g. for eyots/bars) • River splits and flows around the deposits at times of low discharge (e.g. for the channel, etc.) • Bars may become stabilised by growth of vegetation The features may be explained as separate features. However, the above generic points should form their explanation. 1 mark for each simple explanation, 2 marks for a developed explanation up to the maximum.	**6**

Atmosphere and weather

Question	Answer	Marks
2(a)	**Fig. 2.1 shows albedo values for various surface conditions.** **Identify the highest albedo value for snow shown in Fig. 2.1.** 83 to 84.5% Need % for mark.	**1**
2(b)	**Compare the albedo values for the surface conditions shown in Fig. 2.1.** Possible points of comparison are: • Snow has the greatest range and also the highest value • Snow has a similar range to clouds • Forest and crops have a similar range • Water has the lowest range and also the lowest values in general • Dry soil has intermediate values and range of values • Crops and forest in general have low values and low ranges • Clouds have a large range and generally high values depending on the type of clouds Four relevant comparisons for 4 marks. There must be both similarities and differences for maximum marks.	**4**
2(c)	**Explain how albedo affects the diurnal energy budget.** The main points: • Definition of albedo • The amount of incoming shortwave radiation will be reduced by cloud reflection • The amount of radiation absorbed and not reflected by the various types of ground cover with differing albedos • This different surface will radiate different amounts of longwave radiation affecting elements such as latent heat transfer and sensible heat transfer • The amount of radiation absorbed by the ground will affect the amount that can be re-radiated at night • No albedo effect at night because of no incoming shortwave radiation Development might be in terms of the main components of the diurnal energy budget such as latent heat and sensible heat transfer, which could be provided in an annotated diagram. 1 mark for each simple explanation, 2 marks for a developed explanation up to the maximum.	**5**

Rocks and weathering

Question	Answer	Marks
3(a)	**Fig. 3.1 and Fig. 3.2 show two convergent plate boundaries.** **State the tectonic process occurring at Z in Fig. 3.1.** Subduction/slab pull	**1**
3(b)	**Compare the tectonic processes shown in Fig. 3.1 and Fig. 3.2.** The main points of comparison are: • Both figures illustrate convergence of plate boundaries • Convection currents occur in both figures • Fig. 3.1 shows a continent-oceanic but Fig. 3.2 shows a continent-continent convergence • In Fig. 3.1 there is subduction of the oceanic plate, whereas in Fig. 3.2 there is no subduction but collision • There is the formation of fold mountains in both figures • There is volcanic activity in Fig. 3.1 but not in Fig. 3.2 • No melting in Fig. 3.2 but there is melting in Fig. 3.1 Four relevant comparisons for 4 marks. There must be both similarities and differences for maximum marks. If no explicit comparison, max. 3.	**4**
3(c)	**Explain the tectonic processes associated with divergent plate boundaries.** Explanation should be based on: • Convection currents driving the movement apart of the two plates • Ridge push also aids spreading • Faulting and creation of a rift valley • Magma erupting from the gap left by the divergence • Solidification of magma to form mid-ocean ridges • Creation of volcanoes/islands Credit an accurate annotated diagram. 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)	**Define the hydrological terms *recharge* and *infiltration*.** Recharge is the percolation of water (1) into a groundwater store (1). Infiltration is the movement of water from the ground surface (1) into the soil (1).	**4**
4(a)(ii)	**Briefly explain how interception is affected by vegetation type**. The main points of consideration are: • Vegetation will affect interception by the nature, size and density of its foliage and stems (branches) • Consideration of specific types such as trees (deciduous/evergreen), bushes, grass, agricultural crops, etc. A mark can be awarded for definition of interception and also for discussion of basic size/density.	**3**

Question	Answer	Marks
4(b)	**Describe and explain helicoidal patterns of flow and turbulent patterns of flow in river channels.** Helicoidal flow is often described as a corkscrew flow and is frequently shown as a squiggle down the centre of the channel. This is misleading. Corkscrew can be used as a general term but should indicate a movement from the inner bank across the surface to the outer bank and then a return as a deep flow to the inner bank in a downstream direction. It is generally explained by the disruption in river flow caused by pools and riffles. Turbulent flow is a movement in swirls and eddies caused by obstacles on the bed and bed roughness in general. The obstacles interrupt the downstream flow causing flows in horizontal and vertical directions that appear to be random. Higher velocities tend to produce more turbulent flow in combination with the obstacles. Credit can be given for 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 describes and explains helicoidal and turbulent flows in river channels and is balanced between the two movement types. 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 helicoidal and turbulent flows in river channels but is unbalanced. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response describes and explains helicoidal and turbulent flows in river channels. 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 view that rainfall intensity is the most important factor in causing a river to flood.** 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. Obviously, a river will not flood without rainfall except for rapid snow and glacier melt, a dam burst, both natural such as moraine dam or an artificial dam of a lake or reservoir or release of water from a reservoir. These points, if raised, would increase the conceptual understanding of the question. Rainfall intensity will be important but will depend on the characteristics of the drainage basin and the balance between infiltration and runoff. This balance will depend on the nature of the soils as influenced by rock type as well as topography. There is always a trade-off between rainfall intensity and a large rainfall amount but with low intensity, and the distinction may be made between infiltration excess overland flows (usually the result of high intensity rainfall) and saturated overland flows (the result of more prolonged rainfall). Drainage basin size and drainage density could also feature in the analysis. Human influence could also be relevant. Such points, if discussed, would indicate a higher level of answer. Award marks based on the quality of the response using the marking levels below. **Level 4 (12–15)** Response thoroughly discusses the view that rainfall intensity, in comparison with other factors, is the most important factor in causing a river to flood. 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 view that rainfall intensity is the most important factor in causing a river to flood but may be unbalanced with an analysis of other factors. 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 rainfall intensity is the most important factor in causing a river to flood. 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 view that rainfall intensity is the most important factor in causing a river to flood 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)	**Outline the main characteristics of greenhouse gases.** The main points: • At least two named atmospheric greenhouse gases • which allow incoming shortwave/solar radiation to pass through the atmosphere • but which trap outgoing longwave radiation Three relevant points for 3 marks.	**3**
5(a)(ii)	**Explain how a mountain range can lead to precipitation.** The main points are: • Air is moved by winds toward a topographic barrier (mountains) • The air is forced to rise over the mountains • On rising, it cools • Leading to condensation (dew point) • Water droplets then coalesce, leading to precipitation Four points for 4 marks. Credit use of diagram.	**4**

Question	Answer	Marks
5(b)	**Explain how latitude influences the seasonal variation of temperature and pressure.** The pattern of temperature is largely governed by the apparent shift north and south, within the tropics, of the overhead sun which provides the radiation input. This governs the three cells in the tri-cellular model, which will probably form the basis of the answer. Air is heated and rises causing low pressure and descending air leads to high pressure, associated with the operation of the three cells. Emphasis needs to be on seasonal variations. Tilt of the earth, contrast between summer and winter in high latitudes. Discussion of limited seasonal variation at the tropics is also creditworthy. Award marks based on the quality of explanation and breadth of the response using the marking levels below. **Level 3 (6–8)** Response explains how latitude influences the seasonal variation of temperature and pressure. 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 influences the seasonal variation of temperature and pressure. Response develops on a largely secure base of knowledge and understanding but is unbalanced. Examples may lack detail or development. **Level 1 (1–2)** Response explains how latitude influences the seasonal variation of temperature and pressure. 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 reference to a case study, assess the extent to which human activity has affected the climate of an urban area.** 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. The detail in the answer will depend on the urban area chosen. However, there needs to be detail that is relevant to that urban area and not just a mention of an urban area with essentially a generic answer. The statement implies that specific areas in the urban area with different human activities exhibit variations in climate (temperature, precipitation, wind, humidity) that need to be discussed. 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 variations in the climate in the urban area are the result of human activity. 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 variations in the climate in the urban area are the result of human activity 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 variations in the climate in the urban area are the result of human activity. 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 variations in the climate in the urban area are the result of human activity 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 how a rotational slide can affect a slope.** A rotational slide produces the following changes: • A steep back scar • A backward rotated failure mass • An elongated toe feature extending at the end of the failure • There may be lateral tension marks (crevasses) on the failed mass • It may also change other factors of the slope such as vegetation cover, stability, water movement, etc. Most of these could be portrayed in an annotated diagram. Three relevant points for 3 marks.	**3**
6(a)(ii)	**Define the terms *sheetwash* and *rills*.** Sheetwash is the downslope, surface movement of water (1) in a flat/thin sheet or layer (1). Rills are shallow/fine/small channels on a slope (1) within which water moves following rainfall (1).	**4**

Question	Answer	Marks
6(b)	**Explain how the chemical composition of rocks and the physical structure of rocks affect the way they are weathered**. Both physical structure (joints, bedding planes, etc.) and chemical composition (probably using granite and/or limestone) need to be discussed. Both physical and chemical weathering processes need examination. Chemical composition will determine what chemical weathering processes can occur, e.g. limestones with a high calcium carbonate content will be susceptible to carbonation, granite with feldspar content will be chemically weathered by hydrolysis, etc. Physical structure, the jointing, extent of bedding planes, etc. will influence physical weathering processes such as freeze-thaw which requires joints/pore spaces to be effective; heavy jointing will also increase the efficacy of chemical weathering processes as they represent a greater surface area. Award marks based on the quality of explanation and breadth of the response using the marking levels below. **Level 3 (6–8)** Response explains how the chemical composition and the physical structure of rocks affect the way the rocks are weathered. 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 chemical composition and the physical structure of rocks affect the way the rocks are weathered but may be unbalanced. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response explains how the chemical composition and the physical structure of rocks affect the way the rocks are weathered. 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)	**'Mass movement on slopes is mainly the result of human activity.'** **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. This is essentially a generic question but the use of examples to illustrate the points is necessary. The answer should be underpinned by a thorough analysis of the causes of mass movement such as factors and processes that increase shear stress or reduce shear strength, with an assessment as to how significant human activity is in relation to such factors and processes. 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 mass movement on slopes is mainly the result of human activity with extensive use of relevant examples. 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 mass movement on slopes is mainly the result of human activity but may be unbalanced in its treatment of human and natural causes. 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 mass movement on slopes is mainly the result of human activity. 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 mass movement on slopes is mainly the result of human activity 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**