Cambridge Assessment International Education

Cambridge International AS & A Level

GEOGRAPHY **9696/13**

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.

[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)
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)	**Table 1.1 shows the precipitation routes for three land uses.** **Calculate the percentage of precipitation that has entered the ground in the forested area.** 50% (Accept 50 as percentage is specified in the question)	**1**
1(b)	**Compare the precipitation routes for the three land uses shown in Table 1.1.** The question can be approached through land use types or precipitation routes. The answer should be in general statements but backed up with data. By comparing <u>precipitation routes</u>: • Evapotranspiration decreases from the forested area to the urban area from 40% to 38% to 30% • Runoff increases steadily in amounts from forested to rural areas, but with a greater increase (20% to 55%) from the rural area to the urban area • Infiltration amounts decrease slightly from the forested area to the rural area (25% to 21%) but with a great decrease to 10% in the urban area • Percolation decreases by the same amount as infiltration between the forested area and rural area but decreases by a greater amount from the rural area to the urban area By comparing <u>land use</u>: • Forested area has the highest evapotranspiration (40%), the same infiltration and percolation (25%) • Rural area has similar evapotranspiration rate (38%) as forested area (40%)/higher infiltration and percolation rates than urban areas • Urban area has the highest runoff (55%) and lowest rates of percolation (5%) All land uses and precipitation routes need to be covered for full marks. Four relevant comparative points for 4 marks. Simple comparisons only (limited range) max. 3.	**4**

Question	Answer	Marks
1(c)	**Suggest how the storm hydrograph for a drainage basin in a forested area would differ from that in an urban area.** The hydrograph for the forested area will have: • Gentle rising and falling limbs (flat/steady), whereas that for the urban area will have steep rising and falling limbs (flashy) • The peak for the forested area will be lower than for the urban area • Lag time will be longer for the forested area than for the urban area • The duration of the hydrograph will be longer for the forested area than for the urban area 1 mark for each simple description, 2 marks for a developed description up to the maximum. Credit diagrams if appropriate.	**5**

Atmosphere and weather

Question	Answer	Marks
2(a)	**Fig. 2.1 shows a model of daytime and night-time surface temperatures across an urban area.** **With reference to Fig. 2.1, state the land use with the smallest difference between the daytime and night-time surface temperatures.** Lake.	**1**
2(b)	**Compare the daytime and night-time surface temperatures across the urban area shown in Fig. 2.1.** The main points of comparison are: • Daytime temperatures are always higher than night-time temperatures • Night-time temperatures have a more even trend compared to the marked fluctuations for the daytime temperatures • Both daytime and night-time peaks are over the urban centre • There is a secondary peak for daytime temperatures over the industrial area, but not at night • Night-time temperatures have a sharp rise over the lake whereas daytime temperatures are depressed at this point • Daytime temperatures have a sudden drop over the park which is not replicated in the night-time temperatures Four relevant comparative points for 4 marks. Explanations not required.	**4**
2(c)	**Suggest reasons for the pattern of daytime and night-time surface temperatures shown in Fig. 2.1.** The explanation will be based on the heat island effect. The main points of consideration are: • Daytime temperatures fluctuate considerably depending on the nature of the land use (building type and structure) • Human activities (industrial processes, traffic, etc.) lead to high daytime temperatures • Night-time temperatures show a clear pattern of higher temperatures over the main city area with a spike over the lake because the thermal capacity of water maintains an even temperature • The night-time pattern is the result of a release of heat energy that has been absorbed during the day, largely a result of the low albedo of the surfaces and heat released by human activity • Pollution and cloud enhance the blanketing effect of released radiation • No solar radiation at night, only longwave radiation 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 is a photograph which shows mass movements on a coastal cliff in Dorset, UK.** **Name the mass movement feature labelled X in Fig. 3.1.** Flow/slide are acceptable (e.g. mud, debris, etc.).	**1**
3(b)	**Describe the main features of the mass movements shown in Fig. 3.1.** The features that could be mentioned are: • Multiple failures • Lobe on the beach • Debris of various sizes • Colour contrast (varied geology) • Upper scars/cliff face/steep upper slope • Material being washed away by the sea • Lack of vegetation Four relevant points for 4 marks.	**4**
3(c)	**Explain the conditions under which mass movements such as those shown in Fig. 3.1 occur.** The photograph will help in the analysis but explanation can be purely generic. The following examples are relevant, but need explanation: • Steep slopes • Undercutting by the sea removes support • Lack of vegetation • Increased instability by additional weight (water content) • Increased instability through lubrication (water content), pore water pressure • Nature of material/structural weakness/weathering • Human activity in general • Seismic activity 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 fluvial terms *cavitation* and *solution*.** Cavitation is the erosion process where air becomes trapped in pores and crevices in the riverbank (1) leading to an increase in air pressure (1) which is suddenly released, resulting in erosion (1). Solution is a chemical process (1) of rocks/minerals which are soluble in mineral water (1) and then transported by the river (1). Reserve 2 marks for each definition.	**4**
4(a)(ii)	**Briefly explain the process of saltation within a river channel**. • Sediment/loose material moves in a series of leaps • Sediment is too heavy to be moved in suspension by insufficient energy • Sediment too light to be moved exclusively by traction because of high discharge/velocity Three relevant points for 3 marks. Credit the use of accurately annotated diagrams.	**3**

Question	Answer	Marks
4(b)	**Describe and explain how the landforms of a braided river channel differ from those of a meandering river channel.** Landforms of braided channels are essentially multiple channels, eyots, sand bars visible at low flows. The channel cross-section is usually rectangular with both banks being similar. Meandering channels generally have pools and riffles, undercut banks, slip off slopes (point bars), ox bow lakes. Cross-sections are asymmetrical. Explanation will be in terms of fluctuating velocity, discharge and load for braided channels and the evolution of helicoidal flow in relation to pools and riffles in meandering channels. Credit the use of diagrams. Award marks based on the quality of description and explanation and breadth of the response using the marking levels below. **Level 3 (6–8)** Response describes and explains how the landforms of a braided river channel differ from those of a meandering river channel. 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 how the landforms of a braided river channel differ from those of a meandering river channel. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response describes and partially explains how the landforms of a braided river channel differ from those of a meandering river channel. 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)	**'Soft engineering is more effective than hard engineering in the prevention of river floods.'** **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. Soft and hard engineering techniques need to be discussed and assessed. The best assessments will use relevant examples to underpin the assessment. The detail of the techniques, the balance between soft and hard engineering and use of relevant examples will determine the level awarded. Soft engineering could include: floodplain zoning, development of wash-lands, afforestation, riverbank conservation, river restoration schemes, etc. Hard engineering could include: dams, reservoirs, embankments, dredging, straightening, retention basins, flood relief channels, etc. Award marks based on the quality of the response using the marking levels below. **Level 4 (12–15)** Response thoroughly discusses whether soft engineering is more effective than hard engineering in the prevention of river floods. 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 whether soft engineering is more effective than hard engineering in the prevention of river floods 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 as to whether soft engineering is more effective than hard engineering in the prevention of river floods. 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 whether soft engineering is more effective than hard engineering in the prevention of river floods but does not address the question and does not come to a convincing conclusion. Response is descriptive, knowledge is basic and understanding is poor.	**15**

Question	Answer	Marks
4(c)	**Level 0 (0)** No creditable response.	

Atmosphere and weather

Question	Answer	Marks
5(a)(i)	**Define the atmospheric terms *snow* and *sensible heat transfer.*** Snow is atmospheric water vapour frozen into ice crystals (1) and falls from the clouds/as light white flakes (1). Crystals are aggregated (1). Sensible heat transfer is the transfer of heat into or out of an area (1) by either convection or conduction or advection (1). It changes temperature rather than phase (1). Reserve 2 marks for each definition.	**4**
5(a)(ii)	**Describe the enhanced greenhouse effect**. • The greenhouse effect describes the trapping of outgoing longwave radiation by greenhouse gases (e.g. carbon dioxide, methane, water vapour and others) • This causes the atmosphere to heat up • The enhanced effect is the result of the increase in the amount of these gases by human activities Three relevant points for 3 marks.	**3**

Question	Answer	Marks
5(b)	**Describe and explain how the energy budget is different between daytime and night-time.** Both the daytime and night-time energy budgets need a thorough description with an explanation of the differences. The main difference is that there is no incoming shortwave solar radiation during the night-time but there is outgoing longwave terrestrial radiation during the night. There is no reflected or absorbed radiation during night-time. Daytime energy budget includes solar radiation, reflected solar radiation, absorbed energy, longwave radiation, sensible heat transfer, latent heat (evaporation). Night-time energy budget includes conduction to the surface, longwave radiation, sensible heat transfer, latent heat transfer (condensation). Credit the use of diagrams. Award marks based on the quality of description and explanation and breadth of the response using the marking levels below. **Level 3 (6–8)** Response describes and explains how the energy budget differs between daytime and night-time. 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 partially explains how the energy budget differs between daytime and night-time. 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 how the energy budget differs between daytime and night-time. 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 and sea distribution has the greatest effect on seasonal variations in global pressure systems.'** **With the aid of examples, to what extent 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. Latitude and seasonal variations in temperatures give rise to the tricellular model and seasonal movement of global pressure systems. However, land and sea distribution linked to seasonal temperature change also helps to explain low pressure monsoon systems and continental high pressure systems during summer and winter seasons respectively. Explanations based on land and sea distribution need assessing with reference to latitude and seasonality. Award marks based on the quality of the response using the marking levels below. **Level 4 (12–15)** Response thoroughly discusses whether land and sea distribution has the greatest effect on seasonal variations in global pressure systems. 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 whether land and sea distribution has the greatest effect on seasonal variations in global pressure systems but may be unbalanced in its assessment 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 as to whether land and sea distribution has the greatest effect on seasonal variations in global pressure systems. 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 whether land and sea distribution has the greatest effect on seasonal variations in global pressure systems 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)	**Outline the main differences between continental tectonic plates and oceanic tectonic plates.** • Continental plates are thicker/oceanic plates are thinner • Continental plates are older/oceanic plates are younger • Continental plates are of lower density/oceanic plates are of higher density (not simply heavier) • Continental plates are composed of granitic type rocks (sial)/oceanic plates are composed largely of basaltic rock (sima) • Continental plates can provide a larger variation of rock types 1 mark for each valid point up to the maximum.	**3**
6(a)(ii)	**Explain the mass movement process of heave.** Heave involves: • The uplifting of particles out of a slope, usually perpendicular to the slope • Followed by its vertical drop leading to movement in a downslope direction • The process of uplift can be wetting/drying, causing expansion and contraction • The expansion of needle ice (pipkrakes) in the soil forcing soil particles out of the slope 1 mark for a simple explanation and 2 marks for a developed explanation up to the maximum. Credit the use of diagrams.	**4**

Question	Answer	Marks
6(b)	**Explain how human activity may decrease the stability of slopes.** This is essentially a generic question but the use of located examples to illustrate the points may enhance the answer. The answer should be underpinned by a thorough analysis of the causes of mass movement with an assessment as to how significant human activity is in affecting these causes. Stability can be decreased by reducing the strength of the slope or by increasing the stresses on the slope. Some examples of how stability can be decreased include: • Increasing the slope angle by undercutting the slope such as road construction • The dumping of material on slopes • Agriculture • Change of land use such as deforestation • Water directed toward the slope (weight and liquidity) • Climate change (increased precipitation) • The weight of buildings on the slope, etc. 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 human activity can decrease 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 can decrease 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 explains how human activity can decrease 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)	**With the aid of examples, assess the extent to which subduction is the most significant process in the formation of landforms associated with the movement of tectonic plates.** 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. Subduction is an important process in the creation of landforms associated with destructive plate boundaries (deep sea trenches, fold mountains, island arcs/volcanoes), but is not involved in the formation of fold mountains at collision plate boundaries nor the ocean ridges, volcanic activity, faulting/rifting associated with divergent plate boundaries. These differences will form the basis of the assessment. Conservative plate boundaries do not usually produce significant landforms. Credit valid diagrams. 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 subduction is the most important process in the formation of landforms associated with the movement of tectonic plates. 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 subduction is the most important process in the formation of landforms associated with the movement of tectonic plates 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 subduction is the most important process in the formation of landforms associated with the movement of tectonic plates. 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
6(c)	**Level 1 (1–3)** Response may broadly discuss the extent to which subduction is the most important process in the formation of landforms associated with the movement of tectonic plates 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.	