Cambridge International AS & A Level

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GEOGRAPHY **9696/11**

Paper 1 Core Physical Geography **May/June 2019**

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.

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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.

Section A

Answer **all** questions in this section.

Hydrology and fluvial geomorphology

Question	Answer	Marks
1(a)	**Fig. 1.1 shows a photograph of a delta.** **Draw a sketch map of the delta in Fig. 1.1. Label the main features.** The sketch map needs to be based on the photograph, but does not need to perfectly represent the photograph. The sketch map could include: • the distributary channels • the elongated, branching form • the sediment or vegetation The sketch map should <u>not</u> be an idealised/theoretical delta or a cross section. 2 marks for the accuracy and spatial representation of the diagram. Features which could be labelled include: • distributaries (do not accept tributaries) • braided streams • deposits (alluvial) • vegetation • eyots • river • fine sediment offshore • bay 2 marks can be given for two accurate labels. No credit can be given for features not seen in the photograph.	**4**
1(b)	**Briefly explain the formation of the features you labelled in <u>(a)</u>.** Comments relating to the formation of the features can include: • the volume of the sediment from the river – including the proportion of the bedload to suspended load (1) • the different densities of the river and sea water (1) • the relatively little strength of the tide and wave action and longshore drift resulting in a more elongated shape (1) • flocculation of clays (1) • the stability of the coastal zone, and factors which affect this (1) • the high bedload resulting in braiding of the distributary channels (1) 1 mark for each simple explanation, 2 marks for a developed explanation. Explanation of features not shown in (a) maximum 1 mark.	**3**

Question	Answer	Marks
1(c)	**Using Fig. 1.1, suggest how the delta may change shape over time.** There are three ways that the delta may change shape – internal changes, reduction in size or increase in extent. These changes are related to changes in sediment supply, discharge of the main river and strength of marine processes (longshore drift, strength of the waves etc.). The question is 'suggest' therefore detailed explanation is not required. There are two ways the delta may change over time. Distance from the shoreline or by lateral movement. (Where movement occurs significantly, leading to a key shift in the location of the delta, the term avulsion may be used.) Candidates may comment on: • the change of the beds building out over time (1) – especially as there is a lot of sediment shown within the photograph • following deposition, the number of distributaries may change (1) and new channels may be built (1) • reduction in size by increased marine erosion (1) • avulsion may occur between distributaries (1) 1 mark for each simple suggestion, 2 marks for a developed suggestion up to the maximum of 3 marks.	**3**

Atmosphere and weather

Question	Answer	Marks
2(a)	**Fig. 2.1 shows the global pattern of ocean currents.** **Using Fig. 2.1, describe the pattern of ocean currents in the Northern Hemisphere.** The emphasis should be on the pattern and not a current by current account: • most are (circular) clockwise (1) • north of 50 °N e.g. Alaska, Norwegian are also circular but anticlockwise (1) • all have the warmer current flowing towards the north (and the colder current flowing towards the south) (1) • N. Equatorial current flowing west between 10 °N and 20 °N (1) • the majority are warm currents (1) Three points for 3 marks.	**3**
2(b)	**Explain <u>two</u> ways in which the ocean currents described in <u>(a)</u> affect the seasonal variation of temperature in the Northern Hemisphere.** The emphasis should be on seasonal variation. Seasonal changes in temperatures can be a result of winds, modified by the temperature of ocean currents, meeting continental air (prevailing winds will influence the effectiveness of changing temperatures at the coast). Ocean currents transport heat energy (about 25% of the total energy budget). Thus, ocean currents will tend to decrease seasonal temperature variations in coastal areas (warm ocean currents will tend to increase minimum winter temperatures, cold ocean currents will tend to decrease summer maximum temperatures) 1 mark for a simple explanation. 2 marks for each developed explanation.	**4**

Question	Answer	Marks
2(c)	**Explain <u>one</u> factor, other than ocean currents, that affects the seasonal variation of temperature in the Northern Hemisphere.** The syllabus suggests that the candidate can offer either latitude or land sea distribution with the emphasis again on seasonal variations. For latitude the apparent movement of the sun, north and south, will affect seasonal variations in temperature. This could be linked to seasonal pressure changes and winds. The seasonal shift of pressure systems in monsoon climates might be a specific example. Land-sea distribution could be part of another explanation with different thermal capacities of the land and sea. The sea heats more slowly in the summer than the land, and retains heat in the winter more than the land. 1 mark for a simple explanation, 2 marks for a developed explanation up to the maximum of 3 marks.	3

Rocks and weathering

Question	Answer	Marks
3(a)(i)	**Fig. 3.1 shows a slope profile.** **Using Fig. 3.1, name feature: A** Scarp face / free face / rock face Other possibilities seen: scar, scarp, cliff	**1**
3(a)(ii)	**Using Fig. 3.1, name feature: B** Scree (slope) / talus / debris (slope) / regolith lobe and toe not acceptable.	**1**
3(b)	**With reference to Fig. 3.1, describe the formation of feature B.** The main points are: • the detachment of material from the rock face (1) • by weathering (rockfall) or sliding (rock slide) (1) • the accumulation of material on the lower slope (1) • at the angle of repose, 30–35^{o} (1) Credit alternative reasonable descriptions.	**3**
3(c)	**Explain how water affects the movement of material on slopes.** Water can affect the movement of material on slopes in a variety of ways. The syllabus suggests mass movement (heaves, flows, slides and falls), rainsplash and surface runoff (sheetwash and rills). Explanations could include: • addition of weight to slope materials increasing downslope stress (the gravity effect) • reduces internal strength by reducing cohesion by increased pore water pressures creating a greater fluidity such as in mudflows • lubricating shear planes possibly leading to landslides • water-induced weathering on rock faces leading to rockfalls • freeze-thaw and wetting and drying in soils leading to heaves and downslope movement • overland flow leading to sheetwash or rill/gully action 1 mark for each simple explanation, 2 marks for each developed explanation or 3 marks for each well-developed explanation. Development might come as depth of explanation or the linking of factors.	**5**

Section B

Answer **one** question from this section.

Hydrology and fluvial geomorphology

Question	Answer	Marks
4(a)(i)	**Describe how drainage density is measured.** Total length of all the streams (1) and area of drainage basin (1) Drainage density is total length divided by area of the basin (1)	**3**
4(a)(ii)	**Briefly explain how velocity affects erosion in a river.** Clear reference to the Hjülstrom curve (HC) would be a way of addressing this answer. In the main, higher velocities mean that the rate of erosion increases. The HC shows that for particles which are the size of sand and above, the higher the velocity, the more likely it is that larger particles are being entrained and eroded. A candidate may make reference to the cohesive nature of clay. Most erosion takes place during bankfull conditions. However, approximately 90% of the total energy in a stream is used to overcome friction so efficiency has a major effect on the amount of erosion. 1 mark for each point, 2 marks for a developed point up to the maximum. A developed point could explain with more detail or examples.	**4**

Question	Answer	Marks
4(b)	**Explain how catchment flows and stores are affected by urbanisation.** Both flows and stores will need to be considered (both underground and above ground). Answers should appreciate that it is not a simple change such as everything reduces – and in fact the response should cover an awareness that because of some urban designs, the flows may increase. Reference to throughflow, infiltration, percolation, surface storage, are appropriate. In addition, it may be suggested that it is also the demand for water which means flows and stores are affected beyond the urban area. The size of the urban area can affect the way these flows and stores are affected. Also, the question refers to urbanisation, thus the change of land use (e.g. deforestation) as the urban area increases is also acceptable. 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 both the flows and stores are affected by urbanisation. Response is well founded in detailed knowledge and strong conceptual understanding of the topic. Any examples used are appropriate and integrated effectively into the response. **Level 2 (3–5)** Response explains how either the flows or stores are affected by urbanisation. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response contains some understanding of flows and/or stores and urbanisation though the terms are lacking and the link is vague. 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 flooding impacts people more than it impacts the environment.' 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 route is chosen, essays which discuss the key aspects of environmental impact versus people and support their argument with relevant examples will be credited. There may be detailed consideration of one or more examples, or a broadly conceived response, drawing on several examples to illustrate the factors involved. The approach could be comparing one detailed case study looking at the impact of people verses the environment. Or another approach could be to go through the different impacts (economic / social / environmental) and attempt to quantify them in order for a comparison to be made to then answer the main point of the essay. Although the emphasis will be on negative impacts, the recognition that some environmental impacts could be positive (addition of nutrients, alluvium, creation of diverse habitats such as wetlands, marshes) might indicate a higher level response. Award marks based on the quality of the response using the marking levels below. **Level 4 (12–15)** Response thoroughly discusses the extent that flooding impacts people more than the environment or vice versa, with clear assessment of contrasts. Response has good contextual understanding of the concepts such as different costs and measures of impacts. Response is well founded in detailed knowledge and strong conceptual understanding of the topic. **Level 3 (8–11)** Response discusses the extent that flooding impacts people more than the environment or vice versa, with assessment of contrasts 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 impacts of floods, but may not consider the balance fully between people and the environment. 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 impacts of 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. **Level 0 (0)** No creditable response.	**15**

Atmosphere and weather

Question	Answer	Marks
5(a)(i)	**Define the terms *sublimation* and *convection*.** The process of changing from a gas to a solid or from a solid to a gas / a change of state (1), without going through the liquid phase (1) Upward movement of air (1) caused as a result of surface heating (1) resulting in less dense air (1) Mark as 2 + 2	**4**
5(a)(ii)	**Describe how clouds form.** The main points are: • upward movement of air (1) • cooling of rising unsaturated air leading to condensation (water vapour to liquid) at the dew point (1) • with tiny particles acting as the nuclei for the condensation to form on (1) • minute water droplets / ice crystals maintained in atmosphere by slight upward movement (1)	**3**

Question	Answer	Marks
5(b)	**With reference to <u>one</u> urban area, describe and explain the effects of human activity on temperature and humidity.** A purely generic answer will not get above the middle of Level 2. Simply stating an urban area with little detail will get little credit. Generally, the temperature is higher namely the term heat island effect. This is caused by several factors such as decreased albedo of urban surfaces, anthropogenic heat, pollution etc. Buildings retain and emit heat produced. Fuel is burnt by homes, offices and transport, which also produces smog, trapping pollutants and outgoing radiation. Also lower windspeeds means warmth is able to accumulate and is not dispersed. With respect to humidity, generally, urban areas are designed to remove surface water as quickly as possible, and so humidity levels during the day will be reduced. During the night, the humidity level, relative to a rural area, can be seen to be higher primarily because of the formation of dew etc in a rural area, reducing the humidity through condensation. 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 how human activity affects both humidity and temperature. Response is well founded in detailed knowledge and strong conceptual understanding of the topic. Any examples used are appropriate and integrated effectively into the response. **Level 2 (3–5)** Response describes and explains how either humidity or temperature are affected by human activity. The response may be unbalanced or the effects are not detailed. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response contains some understanding of how human activity may affect temperature or humidity, though the terms are lacking and the explanation is vague. 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, assess the extent to which albedo is the most important factor in determining the diurnal energy budget.** Candidates are free to develop their own approach to the question and responses will vary depending on the approach chosen. Whichever route is chosen, essays which discuss the extent to which albedo is the most important factor and support their argument with relevant examples will be credited. There may be detailed consideration of one or more examples, or a broadly conceived response, drawing on several examples to illustrate the factors involved. The emphasis should be on the energy budget thus the main components of the diurnal energy budget (incoming solar radiation, outgoing radiation, reflected solar radiation, absorption, sensible heat transfer, latent heat transfer) could be discussed. Albedo will have an effect on all except incoming solar radiation. Daytime and night time need to be considered. However, it is not just the albedo which has a significant influence on the diurnal energy budget. Candidates may mention pollution and cloud cover, which also helps to alter the diurnal energy budget. Or a variety of other factors in the diurnal energy budget – Diagrams of the energy budget can be credited where they help to illustrate their answer. Award marks based on the quality of the response using the marking levels below. **Level 4 (12–15)** Response thoroughly discusses the extent that albedo is the most important factor in determining the diurnal energy budget, with clear assessment of other factors. Response has good contextual understanding of the concepts and the energy budget. Candidates consider the significance of the albedo in determining the diurnal energy budget, and are able to draw examples from different surface materials. Response is well founded in detailed knowledge and strong conceptual understanding of the topic. **Level 3 (8–11)** Response discusses the extent that albedo is the most important factor in determining the diurnal energy budget, with some assessment of other factors 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 that different albedo levels affect the diurnal energy budget. Response is mainly descriptive or explanatory with limited use of examples and understanding of the topic may be partial or inaccurate. Some concluding remarks. General responses without the use of example(s) will not get above the middle of Level 2 (6 marks).	**15**

Question	Answer	Marks
5(c)	**Level 1 (1–3)** Response may broadly discuss the albedo and diurnal energy budget but does not address the question and does not come to a convincing conclusion. Response is descriptive, knowledge is basic and understanding is poor. **Level 0 (0)** No creditable response.	

Rocks and weathering

Question	Answer	Marks
6(a)(i)	**Define the terms *hydration* and *carbonation*.** Minerals absorbing water (1), leading to expansion (1) to create a hydrate / new mineral e.g. gypsum, anhydrate.(1) Rainwater absorbs carbon dioxide to produce slightly acidic water (carbonic acid) (1) which reacts with the calcium carbonate (e.g. limestone) resulting in soluble calcium bicarbonate (1). Mark as 2 + 2	**4**
6(a)(ii)	**Briefly describe how rock type affects the rate of physical weathering.** Reference to: • the different rates of permeability (e.g. typically igneous rocks are less permeable than sedimentary rocks) (1) • different rates of porosity (1) • the blocky nature (jointing) such as limestone (1) or bedding planes such as a sandstone (1) strata etc. in some (1) • different mineralogy affecting insolation weathering (1) • types of physical weathering (freeze-thaw, heating/cooling, salt crystal growth, pressure release (dilatation)), and vegetation root action (1) 1 mark for each simple description, 2 marks for each developed description or 3 marks for each well-developed description. Development might come as depth of explanation or the linking of factors.	**3**

Question	Answer	Marks
6(b)	**Describe and explain the formation of ocean trenches.** Both description and explanation need to be present. Description could include: long narrow, trenches, approximately 10km deep, arc shaped, with steep sides. They are features of subduction zones. Formed at plate convergent zones by the denser oceanic plate being subducted under either a continental plate, or under a less dense oceanic plate. The movement of the plates is caused by convection currents. The subducting plate is dragged downwards and the movement leads to a downwarping of the non-subducting plate creating a deep trench. The formation of accretionary wedges might also be relevant. Credit any diagrams where they serve to help describe or explain the formation. 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 way ocean trenches are formed. There is thorough reference to the processes present. Response is well founded in detailed knowledge and strong conceptual understanding of the topic. Any examples used are appropriate and integrated effectively into the response. **Level 2 (3–5)** Response describes and/or explains the way ocean trenches are formed. There is clear reference to the processes present. The response may be unbalanced or where both description and explanation is mentioned, the link with the resulting features of an ocean trench is weaker. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response contains some description or explanation of ocean trenches. There is little or no reference to the processes present. The terms are lacking and the link is vague. 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 mass movement on slopes can be reduced.** Candidates are free to develop their own approach to the question and responses will vary depending on the approach chosen. Whichever route is chosen, essays which discuss the key focus of the extent that mass movement can be reduced – so reference to the actual prevention measures and cause of mass movement can be expected and support their argument with relevant examples will be credited. There may be detailed consideration of one or more examples, or a broadly conceived response, drawing on several examples to illustrate the factors involved. The syllabus lists pinning, netting, grading and afforestation but there are many others than could be mentioned. The approach could be comparing successful attempts against unsuccessful attempts at reducing mass movements on slopes, or to look at one example more in depth and illustrating what has been done and the extent of the success. It will be difficult to achieve this without reference to specific examples. Award marks based on the quality of the response using the marking levels below. **Level 4 (12–15)** Response thoroughly discusses the extent that mass movement can be reduced, with clear assessment of contrasts. Response has good contextual understanding of the limitations of controlling mass movement. Candidates consider the intended and unintended consequences of managing slopes. Response is well founded in detailed knowledge and strong conceptual understanding of the topic. **Level 3 (8–11)** Response discusses the extent that mass movement can be reduced, with some assessment of the contrasts 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 mass movement reduction methods, but may not consider the limits of it or the possible alternatives. 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 mass movement 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**