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**GEOGRAPHY**

**9696/13**

Paper 1 Core Physical Geography

**October/November 2018**

MARK SCHEME

Maximum Mark: 60

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**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.

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This document consists of **13** 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 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)(i)	<p><b>Fig. 1.1 shows components of the drainage basin system.</b></p> <p><b>Using Fig. 1.1, identify:</b></p> <p><b>output A;</b></p> <p>Evaporation</p>	<b>1</b>
1(a)(ii)	<p><b>Using Fig. 1.1, identify:</b></p> <p><b>store B.</b></p> <p>Groundwater</p>	<b>1</b>
1(b)	<p><b>With reference to Fig. 1.1, describe the effect of the trees on the drainage basin system.</b></p> <p>The effect of trees is mainly:</p> <ul style="list-style-type: none"> <li>• to increase evapotranspiration</li> <li>• to slow down water reaching the ground surface by interception, thus reducing surface flow</li> <li>• stem flow will direct water to a particular part of the slope and reduce raindrop impact</li> <li>• to increase the rate of infiltration</li> <li>• the extraction of water by root systems</li> </ul> <p>Candidates might describe other effects. Thus, three basic points for the 3 marks or two points with development of one of the points for the third mark. Explanation is not required but may be incorporated within the description.</p>	<b>3</b>
1(c)	<p><b>Explain why, during a rain event, there could be more overland flow than infiltration.</b></p> <p>There are a number of factors that could be used in the explanation. The important factors are:</p> <ul style="list-style-type: none"> <li>• the amount and intensity of rain overcoming the infiltration capacity of the soil</li> <li>• the infiltration capacity of the soil which is governed by factors such as the porosity and permeability of the soil</li> <li>• antecedent moisture conditions</li> <li>• different land uses (e.g. forestry, arable, pastoral) and surfaces (e.g. impermeable surfaces in urban areas)</li> <li>• steep gradient</li> </ul> <p>1 mark for each simple explanation, 2 marks for a developed explanation, 3 marks for a well-developed explanation up to maximum marks.</p>	<b>5</b>

## Atmosphere and weather

Question	Answer	Marks
2(a)(i)	<p><b>Fig. 2.1 shows average annual solar radiation on land.</b></p> <p><b>Using Fig. 2.1, give:</b></p> <p><b>the average annual solar radiation at 50°S;</b></p> <p>1000–1299 kWh/m<sup>2</sup> or any value in between Units are needed for the mark.</p>	1
2(a)(ii)	<p><b>Using Fig. 2.1, give:</b></p> <p><b>the maximum average annual solar radiation at 40°N.</b></p> <p>1900–2199 kWh/m<sup>2</sup> or 2199 kWh/m<sup>2</sup> Units are needed for the mark.</p>	1
2(b)	<p><b>Briefly describe the general pattern of solar radiation shown in Fig. 2.1.</b></p> <p>A number of points could be described but three succinct points are required such as:</p> <ul style="list-style-type: none"> <li>• the contrast/similarity between the northern and southern hemispheres</li> <li>• concentration of high average radiation between the tropics</li> <li>• contrast between the tropics and the equatorial areas</li> <li>• gradual transition north of the Tropic of Cancer and south of the Tropic of Capricorn</li> </ul> <p>Any three relevant points.</p>	3
2(c)	<p><b>Explain the pattern of solar radiation between the Tropic of Cancer and the Tropic of Capricorn shown in Fig. 2.1.</b></p> <p>Candidates may suggest:</p> <ul style="list-style-type: none"> <li>• the movement of the overhead sun</li> <li>• uplift at the ITCZ producing cloud cover</li> <li>• the comparatively lower levels over the equator are due to the cloud cover in these regions</li> <li>• the concentration around the tropics is because of the clear skies associated with the high pressure of the descending limb of the Hadley cell</li> <li>• the impact of cold ocean currents in reducing cloud cover</li> <li>• trade winds can lead to cloud cover on land</li> <li>• continentality can lead to aridity and lack of cloud cover</li> </ul> <p>Explanation for the contrast between the tropics and the equatorial area is needed for full marks.</p> <p>1 mark for each simple explanation, 2 marks for a developed explanation, 3 marks for a well-developed explanation up to maximum marks.</p>	5

**Rocks and weathering**

Question	Answer	Marks
3(a)	<p><b>Fig. 3.1 shows a photograph of a mass movement.</b></p> <p><b>Name the type of mass movement shown in Fig. 3.1.</b></p> <p>Mudflow/debris flow/flow</p>	<b>1</b>
3(b)	<p><b>Draw a labelled sketch diagram of the main features of the mass movement shown in Fig. 3.1.</b></p> <p>The sketch diagram does not have to match perfectly the photograph.</p> <p>The following main features are expected:</p> <ul style="list-style-type: none"> <li>• the narrow flow path</li> <li>• upper scar</li> <li>• deposit at the toe, lobe/delta</li> </ul> <p>The sketch diagram should not be an idealised/theoretical mass movement.</p> <p>2 marks for the diagram and 2 marks for the correct labelling. No credit can be given for features not seen in the photograph.</p>	<b>4</b>
3(c)	<p><b>Explain how the type of mass movement shown in Fig. 3.1 might have occurred.</b></p> <p>Candidates may suggest:</p> <ul style="list-style-type: none"> <li>• high rainfall increases water content and decreases strength, leading to fluidity (raising pore water pressure)</li> <li>• the influence of water in increasing stress by increasing weight; shear stress exceeding shear strength</li> <li>• possibility of slope undercutting</li> <li>• vibrations from the road traffic</li> <li>• damage/deforestation as a result of the road construction</li> <li>• earthquakes</li> </ul> <p>1 mark for each simple explanation, 2 marks for a developed explanation, 3 marks for a well-developed explanation up to maximum marks.</p>	<b>5</b>

**Section B**Answer **one** question from this section.**Hydrology and fluvial geomorphology**

Question	Answer	Marks
4(a)(i)	<p><b>Describe how helicoidal flow occurs in rivers.</b></p> <p>Helicoidal flow is:</p> <ul style="list-style-type: none"> <li>• the cross channel flow of water at meander bends</li> <li>• across the surface from the inner bend and descending at the outer bend</li> <li>• returning to the inner bend at depth</li> <li>• thus it is a spiral movement in relation to depth and width</li> </ul> <p>It is not a simple corkscrew movement down the centre of the channel.</p> <p>Any two of the above, well described, can get maximum marks.</p>	<b>3</b>
4(a)(ii)	<p><b>Briefly explain how sediment is transported in rivers.</b></p> <p>The emphasis is on the command 'briefly'. The forms of transport are:</p> <ul style="list-style-type: none"> <li>• traction</li> <li>• saltation</li> <li>• suspension within the water and not floating on the surface</li> <li>• solution</li> </ul> <p>A list is not acceptable; explanation is required. Reference to velocity and sediment size only (Hjulstrom curve) – maximum 1 mark.</p> <p>At least two of the above for maximum marks.</p>	<b>4</b>

Question	Answer	Marks
4(b)	<p><b>Describe and explain the formation of braided river channel landforms.</b></p> <p>Description of the main features may include a large number of relatively shallow, often fluctuating channels, with vegetated islands (eyots) and unvegetated ephemeral sand bars.</p> <p>Explanation will be in terms of a high sediment load with highly variable discharges (e.g. seasonal flow/glacial meltwater). Mention of highly erodible banks is creditable. It is a combination of these factors that is needed and should form the basis of the explanation.</p> <p>There should be good description as well as explanation, but the emphasis will probably be on explanation.</p> <p>Use of a well-annotated diagram would gain credit.</p> <p>Award marks using the marking levels below.</p> <p><b>Level 3</b> <span style="float: right;"><b>6–8</b></span> Response covers both description and explanation. Description and explanation of the features are well-founded in detailed knowledge and strong conceptual understanding of the topic. Any examples used are appropriate and integrated effectively into the response.</p> <p><b>Level 2</b> <span style="float: right;"><b>3–5</b></span> Response covers both description and/or explanation but explanation of the main features may lack detail. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail.</p> <p><b>Level 1</b> <span style="float: right;"><b>1–2</b></span> Knowledge is basic and understanding may be inaccurate. Both description and explanation will be limited.</p> <p><b>Level 0</b> <span style="float: right;"><b>0</b></span> No creditable response.</p>	8

Question	Answer	Marks
4(c)	<p><b>With reference to a recent river flood event, explain the causes of the flood and evaluate attempts to reduce its impact.</b></p> <p>Candidates are free to develop their own approach to the question and responses will vary depending on the approach chosen.</p> <p>Causes will relate to the specific case study chosen. There are many generic causes that could relate to the flood such as natural causes (intense precipitation, snow melt, impermeable soils and bedrock) and human causes (land use changes, artificial impermeable surfaces).</p> <p>Reducing the impact may mostly focus on hard engineering, but the question is about impact, not solely prevention. This opens the question to a wider variety of ways to reduce the impact such as soft engineering, prediction, insurance, land use planning, post flood aid, etc.</p> <p>Award marks on the quality of the response using the marking levels below.</p> <p><b>Level 4</b> <span style="float: right;"><b>12–15</b></span> Response thoroughly discusses the nature of the flood and its impacts. Response has good contextual understanding of the causes of the flood and specific initiatives for reducing the impact of the flood. Response is well-founded in detailed knowledge of the case study and strong conceptual understanding of the topic.</p> <p><b>Level 3</b> <span style="float: right;"><b>8–11</b></span> Response discusses the causes of the flood and its impacts but discussion may be limited in some detail. The case study may lack detail. However, response develops on a largely secure base of knowledge and understanding.</p> <p><b>Level 2</b> <span style="float: right;"><b>4–7</b></span> Response shows general knowledge and understanding of the causes of the flood but is mainly descriptive and understanding of the topic may be partial and inaccurate. There is some general evaluation of attempts to reduce the impact of the flood.</p> <p><b>Level 1</b> <span style="float: right;"><b>1–3</b></span> Response may broadly discuss the flood but may be mostly generic with little specific information. Response is descriptive with little rational evaluation.</p> <p><b>Level 0</b> <span style="float: right;"><b>0</b></span> No creditable response.</p>	<b>15</b>



**Atmosphere and weather**

Question	Answer	Marks
5(a)(i)	<p><b>Define the terms <i>evaporation</i> and <i>sublimation</i>.</b></p> <p>Evaporation is the change of state of water to a gas (1 mark) by the addition of heat (1 mark).</p> <p>Sublimation is the change of a solid (ice) into water vapour (1 mark) without going through the liquid state (1 mark). It can also act in reverse.</p> <p>Mark 2 + 2.</p>	<b>4</b>
5(a)(ii)	<p><b>Describe the processes that lead to the formation of clouds.</b></p> <p>It requires a simple description of:</p> <ul style="list-style-type: none"><li>• uplift of air</li><li>• cooling leading to condensation</li><li>• which occurs around nuclei</li><li>• to produce the concentration of water droplets for clouds to form</li></ul> <p>Explanation is not required, although description and explanation may be combined.</p> <p>Three points for 3 marks.</p>	<b>3</b>

Question	Answer	Marks
5(b)	<p><b>Explain how land and sea distribution affects seasonal variations in atmospheric pressure.</b></p> <p>The seasonal element introduces the seasonal heating of land and sea with the resulting effects on atmospheric pressure. Thus, there is high pressure in winter over a cold land mass with lower pressure over the oceans and this is reversed in the summer. The influence of the different specific heat capacities of land and water is a major factor in these seasonal patterns.</p> <p>The emphasis is on seasonal variations, so little credit for simply describing and explaining daily land and sea breezes, although there could be some generic points about the differential specific heat capacities of land and water.</p> <p>Award marks on the quality of explanation and breadth of the response using the marking levels below.</p> <p><b>Level 3</b> <span style="float: right;"><b>6–8</b></span> The response covers all elements of the question, especially the seasonality. Explanation is well-founded in detailed knowledge and strong conceptual understanding of the topic. Any examples used are appropriate and integrated effectively into the response.</p> <p><b>Level 2</b> <span style="float: right;"><b>3–5</b></span> Response covers some elements of the question but explanation may be partial and lack detail. Response develops on a largely secure base of knowledge and understanding but may overconcentrate on land/sea breezes. Examples may lack detail or development.</p> <p><b>Level 1</b> <span style="float: right;"><b>1–2</b></span> Knowledge is basic and understanding may be inaccurate. The response will be unbalanced.</p> <p><b>Level 0</b> <span style="float: right;"><b>0</b></span> No creditable response.</p>	<b>8</b>

Question	Answer	Marks
5(c)	<p><b>With the aid of examples, evaluate the possible causes and atmospheric impacts of the enhanced greenhouse effect.</b></p> <p>Candidates are free to develop their own approach to the question and responses will vary depending on the approach chosen.</p> <p>Causes will be in terms of the enhanced greenhouse effect. There needs to be a comprehensive account of the nature and effect of greenhouse gases (such as carbon dioxide, nitrous oxide, methane, water vapour, CFCs) linked to human activities.</p> <p>Atmospheric impact will be:</p> <ul style="list-style-type: none"> <li>• increased temperatures but highly variable, e.g. heat waves</li> <li>• could be increased storminess (hurricanes, cyclones, typhoons, etc.)</li> <li>• changing rainfall patterns in different parts of the world</li> </ul> <p>Award marks on the quality of the response using the marking levels below.</p> <p><b>Level 4</b> <span style="float: right;"><b>12–15</b></span> Response thoroughly discusses the causes of the enhanced greenhouse effect and the possible consequences for atmospheric impacts. Response has good contextual understanding and is well-founded in detailed knowledge and strong conceptual understanding of the topic. Any examples used are appropriate and integrated effectively into the response.</p> <p><b>Level 3</b> <span style="float: right;"><b>8–11</b></span> Response discusses the causes of the enhanced greenhouse effect and the possible consequences for atmospheric impacts, but discussion may be limited in some detail. However, response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development.</p> <p><b>Level 2</b> <span style="float: right;"><b>4–7</b></span> Response shows general knowledge and understanding of the causes of the enhanced greenhouse effect and possible atmospheric impacts, but is mainly descriptive and understanding of the topic may be partial and inaccurate. Specific examples may be lacking.</p> <p><b>Level 1</b> <span style="float: right;"><b>1–3</b></span> Response may broadly discuss the causes of the enhanced greenhouse effect and some possible atmospheric impacts but may be inaccurate. Knowledge is basic and understanding is poor. Response is descriptive with little rational evaluation.</p> <p><b>Level 0</b> <span style="float: right;"><b>0</b></span> No creditable response.</p>	15

## Rocks and weathering

Question	Answer	Marks
6(a)(i)	<p><b>Define the weathering terms <i>hydrolysis</i> and <i>vegetation root action</i>.</b></p> <p>Hydrolysis is a chemical process where hydrogen ions in water (1 mark) react with certain rock minerals to produce soluble hydroxides (1 mark). The best example is the weathering of feldspar to clay (1 mark).</p> <p>Vegetation root action is the growth of roots in joints and crevices of rock (1 mark), forcing them apart as the roots develop (1 mark).</p> <p>Mark 2 + 2.</p>	4
6(a)(ii)	<p><b>Briefly explain how salt crystal growth weathers rock.</b></p> <p>The main points are:</p> <ul style="list-style-type: none"> <li>• salt-rich water can evaporate in the pores or crevices of rock</li> <li>• leading to the growth of salt crystals</li> <li>• repeated action and growth of crystals can exert pressure on the rock</li> <li>• salt crystals can also expand on heating</li> </ul>	3
6(b)	<p><b>Explain how ocean trenches and volcanic island arcs are formed.</b></p> <p>They are both formed when one oceanic plate is subducted beneath another oceanic plate. Ocean trenches can also be formed by the subduction of an oceanic plate below a continental plate. This could be explained in diagrammatic form.</p> <p>Award marks on the quality of explanation and breadth of the response using the marking levels below.</p> <p><b>Level 3</b> <span style="float: right;"><b>6–8</b></span> The response is well-balanced, covering both elements of the question. Explanation is well-founded in detailed knowledge and strong conceptual understanding of the topic. Any examples used are appropriate and integrated effectively into the response.</p> <p><b>Level 2</b> <span style="float: right;"><b>3–5</b></span> Response covers both elements of the question in outline or may focus on one at the expense of the other. Explanation may be partial and lack detail but response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development.</p> <p><b>Level 1</b> <span style="float: right;"><b>1–2</b></span> Knowledge is basic and understanding may be inaccurate. The response will be unbalanced or is lacking in one or the other of the elements. Examples are in name only or lacking entirely.</p> <p><b>Level 0</b> <span style="float: right;"><b>0</b></span> No creditable response.</p>	8

Question	Answer	Marks
6(c)	<p><b>'Rock type is the most important factor in determining the type and rate of weathering.'</b></p> <p><b>With the aid of examples, how far do you agree?</b></p> <p>Candidates are free to develop their own approach to the question and responses will vary depending on the approach chosen.</p> <p>Rock type incorporates structure, texture and chemical composition. Rocks might be affected by the same weathering process but rate of weathering may vary. Both physical and chemical weathering processes should be discussed.</p> <p>Climate is another major factor (chemical weathering, freeze-thaw, salt crystallisation, etc.)</p> <p>Other factors include relief, vegetation, human activity.</p> <p>Award marks on the quality of the response using the marking levels below.</p> <p><b>Level 4</b> <span style="float: right;"><b>12–15</b></span>  Response thoroughly discusses the influence of rock type on weathering. Response has good contextual understanding and is well-founded in detailed knowledge and strong conceptual understanding of the topic. Examples used are appropriate and integrated effectively into the response. There is sound evaluation of factors other than rock type and structure.</p> <p><b>Level 3</b> <span style="float: right;"><b>8–11</b></span>  Response discusses the influence of rock type but discussion may be limited in some detail, possibly paying little attention to rate of weathering. However, response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development and there may be little evaluation of other factors.</p> <p><b>Level 2</b> <span style="float: right;"><b>4–7</b></span>  Response shows general knowledge and understanding of the influence of rock type on weathering but is mainly descriptive and understanding of the topic may be partial and inaccurate. Specific examples may be lacking and with no evaluation of other factors. General responses without the use of examples will not get above the middle of Level 2 (6 marks).</p> <p><b>Level 1</b> <span style="float: right;"><b>1–3</b></span>  Response may broadly discuss the influence of rock type on weathering but may be inaccurate. Knowledge is basic and understanding is poor. Response is descriptive with no rational evaluation.</p> <p><b>Level 0</b> <span style="float: right;"><b>0</b></span>  No creditable response.</p>	15