CAMBRIDGE
International Education

Cambridge International AS & A Level

GEOGRAPHY **9696/11**

Paper 1 Core Physical Geography **October/November 2024**

MARK SCHEME

Maximum Mark: 60

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptions for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

AS Level Geography 9696 (Paper 1 and Paper 2) specific marking instructions

Examiners must use the following annotations:

Annotation	Meaning	Use
	Correct point	Point-marked questions only: Section A, Section B part (a)
	Incorrect	Point-marked questions only: Section A, Section B part (a)
L4	Level 4	Levels-marked questions only: Section B part (c)
L3	Level 3	Levels-marked questions only: Section B parts (b) and (c)
L2	Level 2	Levels-marked questions only: Section B parts (b) and (c)
L1	Level 1	Levels-marked questions only: Section B parts (b) and (c)
0	Level 0 – No creditable response	Levels-marked questions only: Section B parts (b) and (c)
Highlight	Creditworthy part of an extended response	Levels-marked questions only: Section B parts (b) and (c)
EVAL	Evaluative point	Levels-marked questions only: Section B part (c)
^	Omission or further development/detail needed to gain credit	All questions
	Unclear or validity is doubted	All questions
DEV	Developed point	All questions
EG	Appropriate example or case study given	All questions
IRRL	Irrelevant	All questions
NAQ	Material that does not answer the question	All questions
	Highlighting a significant part of an extended response – to be used with another annotation e.g. IRRL or EVAL	Levels-marked questions only: Section B parts (b) and (c)

Annotation	Meaning	Use
SEEN	1. Diagram or essay plan has been seen but no specific credit given 2. Additional page has been checked	1. Any diagrams or essay plans 2. All blank pages in the provided generic answer booklet and/or extension answer booklet(s).
R	Rubric error	Optional questions only (place at start of question not being credited): Section B (Candidates answer one question)

Examiners must consider the following guidance when marking the essay questions:

Candidates are free to develop their own approach to the question and responses will vary depending on the approach chosen. Whichever approach is chosen, essays which address the question and support their argument with relevant examples will be credited. There may be detailed consideration of a case study/one or more examples, or a broadly conceived response, drawing on several examples to illustrate the factors involved.

Section A

Answer **all** questions in this section. All questions are worth 10 marks.

Hydrology and fluvial geomorphology

Question	Answer	Marks
1(a)	**Fig. 1.1 shows the intensity of flooding of parts of the Mississippi River and Ohio River, USA, between 1985 and 2020.** **Name the type of channel within area A shown in Fig. 1.1.** Meandering/meander	**1**
1(b)	**Compare the extent and intensity of flooding of the Mississippi River and Ohio River shown in Fig. 1.1.** The main points are: • Less intense flooding of the Mississippi River compared to the Ohio River • A large area either side of the main meanders of the Mississippi River, but mainly on the east side of the Ohio River • Mississippi River has lower extent of flooding in upper reaches towards north-west, but pattern more uniform for Ohio • Ohio River has greater intensity of flooding. • Both rivers have a flooded area extending up to around 5–8 km away from the river/use of data • Generally, for both rivers the flooding appears to be on the inside of a broad meander bend • Both have areas of intense flooding and less intense flooding Allow other valid comparisons **1 mark** for each comparison.	**4**
1(c)	**Explain how changes in land use might cause a river to flood.** Any land use change that will lead to increased flow to the river channel is relevant. The ones most frequently chosen for explanation are deforestation, urbanisation, and changes in farming practice. Explanation will be in terms of factors that increase the volume of water moving in the river basin hydrological cycle, reduce infiltration and increase overland flow. Factors include: • Construction of housing – impermeable concrete/tarmac reduces infiltration, increases runoff and consequently a potentially flashy flood response • If trees are replaced by arable crops, this diminishes the effect of interception and infiltration, causing rapid runoff and therefore the potential for flooding especially when soil is bare • Changing land use upstream is likely to increase flooding downstream, e.g. removing peat from upland moors, deforestation **1 mark** for each simple explanation, **2 marks** for a developed explanation up to the maximum.	**5**

Atmosphere and weather

Question	Answer	Marks
2(a)	**Fig. 2.1 shows seasonal changes in snow cover in North America, 1975–2020.** **Which season shows the greatest change in snow cover for the period 1975 to 2020?** Summer (June–August)	**1**
2(b)	**Compare the trends in seasonal snow cover shown in Fig. 2.1.** The main points are: • Spring snow cover is greater than summer snow cover • Both trends fluctuate/similar patterns • More fluctuations in spring than summer (2007–2020) • The trend in spring, apart from the fluctuations, is relatively constant • Both have highest values in first decade • Overall, summer trend is for a reduction in snow cover (from 0.8 million square miles in 1975 to 0.4 million squares miles in 2020), spring trend shows less of a marked decline (from 4.5 million square miles in 1975 to 4.2 million square miles in 2020) • Similar patterns of fluctuations **1 mark** for each comparison. **1 mark** available for use of data.	**4**
2(c)	**Explain the formation of snow.** Snow is formed when temperatures are low and there is moisture in the atmosphere. There needs to be reference to evaporation (water vapour), freezing, growing and falling for a complete answer. The main processes in the formation of snow are: • Evaporation to water vapour • If temperatures are cold enough, vapour changes directly into small ice crystals • Ice and super cooled water droplets exist together • Water attracted to ice crystals which grow • Become heavier as updrafts move them through large cloud systems • If heavy enough they start to fall • They will remain as ice crystals if air temperature is low enough • If they fall through moist air, they melt around the edges and stick together forming large flakes **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 a mass movement in the Isle of Wight, UK.** **Name the type of mass movement shown in Fig. 3.1.** (land)slide/ (rock)slide / slump / (rock)fall	**1**
3(b)	**Draw a sketch of the mass movement shown in Fig. 3.1. Label the main features.** The main features include: • Bare head scar/scarp • Steep backwall • Large slumped/failure mass • Vegetation on the slumped mass • Slight erosion by the sea at the end of the mass • Debris forming a toe • Scree The diagram should **not** be an idealised/theoretical landslide. **2 marks** for the diagram. **2 marks** for two correct labels. No credit for features not shown in the photograph.	**4**
3(c)	**Suggests reasons why the mass movement shown in Fig. 3.1 occurred.** Reasons could include: • High precipitation amounts leading to weakening of sheer strength of the slope by adding weight due to saturation, and through lubrication of joints/bedding planes • Rock weathering e.g. freeze–thaw, root penetration • Vibrations/shaking by earthquakes • Undercutting by marine activity, accelerating weakening of cliff • Effects of human activity such as overloading of the slope/ land use changes • Steep gradient/gravity • Deforestation **1 mark** for each explanation, **2 marks** for a detailed 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)	**Describe how throughflow occurs on slopes.** After infiltration of water from the surface (1), percolation through the soil (1) in a downslope direction parallel to the ground surface/flows laterally (1) as a result of gravity (1), More permeable soils (sandy) or steeper gradients have a faster throughflow. (1) **1 mark** for each point to the maximum.	**3**
4(a)(ii)	**Explain how slopes affect the shape of a storm hydrograph.** The shape of the storm hydrograph reflects the speed with which water reaches the river channel. This reflects the balance between infiltration and overland flow. • Steeper slopes encourage more overland flow in comparison to infiltration and tend to increase the 'flashiness' of the storm hydrograph i.e. faster runoff translating into a shorter lag time and higher peak discharge, and greater volume. • Gentler slopes encourage infiltration, leading to a flatter hydrograph, with longer lag time and lower peak discharge. • Vegetated and permeable slopes encourage infiltration etc. • Convex slopes encourage overland flow, and concave slopes encourage infiltration. **1 mark** for simple explanation, **2 marks** for a developed explanation up to the maximum.	**4**

Question	Answer	Marks
4(b)	**Describe and explain the formation of gorges**. Gorges are steep side river valleys where river downcutting has exceeded lateral erosion. The most frequent explanation will probably be the headward extension of waterfalls creating a gorge as the fall retreats. There needs to be explanation of the river processes and perhaps mass movement processes (rockfalls, etc.) that leads to the steep slopes. Credit the use of annotated diagrams. Alternatively, rejuvenation is a valid response. Gorges can be formed by tectonic uplift/changes in sea level, where the river is rejuvenated, and a period of rapid vertical erosion occurs to reach base level. 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 formation of gorges. Response is well founded in detailed knowledge and strong conceptual understanding of the topic. Examples used are appropriate and integrated effectively into the response. **Level 2 (3–5)** Response describes and explains the formation of gorges. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response describes the formation of gorges. 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 can reduce the impacts of river floods but cannot prevent them.'** **With the aid of examples, how far do you agree with this statement?** Soft engineering strategies involve working with natural processes, thereby allowing flooding to occur. These can include: • Floodplain zoning • Washlands upstream • Planting trees in upper catchment/afforestation • River restoration, etc. • River bank conservation, including maintaining natural levees There needs to be a discussion of the various soft engineering strategies with an evaluation of their success in preventing floods. Candidates may conclude that soft engineering may prevent or reduce the impact of a smaller scale flood but be ineffective in a '100 year' flood. There might be a comparison between soft and hard engineering strategies to substantiate the evaluation. Award marks based on the quality of the response using the marking levels below. **Level 4 (12–15)** Response thoroughly assesses the statement that soft engineering can reduce the impacts of river floods but cannot prevent them. 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 statement that soft engineering can reduce the impacts of river floods but cannot prevent them 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 statement that soft engineering can reduce the impacts of river floods but cannot prevent them. 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 soft engineering and impacts 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. **Level 0 (0)** No creditable response.	**15**

Atmosphere and weather

Question	Answer	Marks
5(a)(i)	**Describe the atmospheric process of convection.** As the sun heats the Earth's surface (1), the air above it heats up and rises (1). If conditions allow, this air can continue to rise, cooling as it does so, forming clouds (condensation) (1) or Convection is when warming at the surface causes air molecules to expand (1) become lighter and rise (1) causing the transfer of heat energy to higher altitudes (1) **1 mark** for each descriptive point to the maximum.	**3**
5(a)(ii)	**Explain how fog can form**. Fog is condensation at or near the Earth's surface. Fog forms when moist air is in contact with cool ground. The main ways are: • Radiation fog usually occurs in the winter, aided by clear skies and calm conditions. The cooling of land overnight by thermal radiation cools the air close to the surface. This reduces the ability of the air to hold moisture, allowing condensation and fog to occur. • Advection fog occurs when moist, warm air from the sea passes over the colder land surface and is cooled. This also occurs in cold, clear and calm conditions. • Valley fog forms where cold dense air settles into the lower parts of a valley, condensing and forming fog. It is often the result of a temperature inversion with warmer air passing above the valley. • Upslope fog or hill fog forms when winds blow air up a slope (called orographic uplift). The air cools as it rises, allowing moisture in it to condense. Most answers are likely to focus on radiation fog and advection fog. Two developed explanations could achieve 4 marks. **1 mark** for each simple explanation, **2 marks** for a developed explanation up to the maximum.	**4**

Question	Answer	Marks
5(b)	**Describe and explain how energy is transferred in the atmosphere by wind belts.** There are three prevailing wind belts: the trade winds, the prevailing westerlies, and the polar easterlies. These are linked to the atmospheric circulation cells. Energy is transferred in the atmosphere by the wind belts, which move the air masses from their source areas. The main wind belts are the trade winds, the westerlies and the easterlies. These move from high to low pressure, transferring energy as they go. For example, the south/north westerly wind belts move energy gained from the equator via the subtropical air masses towards the polar regions, hence energy transfer. When the ITCZ moves north the trade winds move north and transfer heat to the northern latitudes. The reverse happens when the ITCZ moves south. Winds travel from high to low pressure. Hot air rises at the equator and moves north and south with the ITCZ transferring heat energy. Winds travelling over the oceans are affected by the temperature of the sea and ocean currents. Award marks based on the quality of explanation and breadth of the response using the marking levels below. Rossby waves and jet streams may be discussed and deserve credit. **Level 3 (6–8)** Response clearly describes and explains how energy is transferred in the atmosphere by wind belts. 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 energy is transferred in the atmosphere by wind belts. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response describes how energy is transferred in the atmosphere by wind belts. 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)	**'The most significant effect of human activity on urban climates is on temperature.'** **With the aid of one or more examples, how far do you agree with this statement?** Reference to the urban heat island model is expected. Temperatures are affected by the albedo of the urban surfaces, heat generated by urban activities such as vehicles, air conditioning units and industry. Buildings also affect the movement of air with less removal of heat. In addition, other climatic variables are affected by human activity: • Lower wind speeds, and wind canyons/eddies • More precipitation due to greater amounts of particulate matter • Increased fog due to particles and lower wind speeds • Variation in humidity due to less vegetation and surface water. Evaluation can be made as to whether the most significant effect of human activity on urban climates is on temperature. This argument needs to be justified, and examples may be used to illustrate the key points being made. Award marks based on the quality of the response using the marking levels below. **Level 4 (12–15)** Response thoroughly assesses whether the most significant effect of human activity on urban climates is on temperature. Examples used are appropriate and integrated effectively into the response. Response is well founded in detailed knowledge and strong conceptual understanding of the topic. **Level 3 (8–11)** Response assesses whether the most significant effect of human activity on urban climates is on temperature but may be unbalanced. Examples may lack detail or development. Response develops on a largely secure base of knowledge and understanding. **Level 2 (4–7)** Response shows general knowledge and understanding of whether the most significant effect of human activity on urban climates is on temperature. Response is mainly descriptive or explanatory with limited use of examples and understanding of the topic may be partial or inaccurate. Some concluding remarks. General responses without the use of example(s) will not get above the middle of Level 2 (6 marks). **Level 1 (1–3)** Response may broadly discuss the effect of human activity on urban climates 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)	**Define the weathering terms *heating/cooling* and *hydration*.** Heating/cooling cycles lead to expansion with high temperatures during the day and contraction with the cooler temperatures at night (1) putting pressure on the rock leading to disintegration/breakdown (1). Hydration is the absorption of water by rock minerals (1), leading to expansion of the mineral (1) putting pressure on the rock leading to disintegration/breakdown (1). Maximum **2 marks** for each definition.	**4**
6(a)(ii)	**Briefly explain how rockfalls occur on slopes.** Rockfalls can be caused in a variety of ways such as by freeze–thaw weathering in rock joints causing rock breakdown (1), vibrations from earthquakes (1) and undercutting by river/glacier processes (1) or human activity such as slope overloading (1), gravity/steep slopes (1). **1 mark** for each point.	**3**

Question	Answer	Marks
6(b)	**Describe and explain the formation of volcanic island arcs**. Volcanic island arcs are chains of volcanic islands. They are formed by the subduction of one oceanic tectonic plate under another oceanic plate. Subduction leads to melting of the subducted plate and the magma then rises through the non-subducted plate to form a chain of volcanoes called a volcanic island arc. The movement of the plates cause the volcanic islands to curve. Credit accurate diagrams. Award marks based on the quality of explanation and breadth of the response using the marking levels below. Some limited credit for understanding processes can be awarded, even though types of plates may be incorrect. **Level 3 (6–8)** Response clearly describes and explains the formation of volcanic island arcs. Response is well founded in detailed knowledge and strong conceptual understanding of the topic. Examples used are appropriate and integrated effectively into the response. **Level 2 (3–5)** Response describes and explains the formation of volcanic island arcs. Response develops on a largely secure base of knowledge and understanding. Examples may lack detail or development. **Level 1 (1–2)** Response describes the formation of volcanic island arcs. 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 rainfall is the most important factor affecting the type and rate of weathering.** Rainfall determines the amount of moisture available for weathering and it has been suggested that moisture is evident in most, if not all types of weathering. Processes such as freeze–thaw, hydration, hydrolysis, carbonation, chelation, wetting and drying and even exfoliation require various levels of moisture. There are many other factors that affect the weathering of rocks such as temperature, rock type and structure, time, vegetation and topography. For example, temperature affects weathering rate and processes: chemical weathering is usually enhanced by higher temperatures, and physical weathering often requires a variation in temperature. Rainfall has to be evaluated with these other factors. Candidates may refer to the Peltier diagram to support their answers. 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 rainfall is the most important factor in affecting the type and rate of weathering. 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 rainfall is the most important factor in affecting the type and rate of weathering 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 rainfall is the most important factor in affecting the type and rate of weathering. 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 rainfall and other factors which affect the type and/or rate of weathering 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**