

# UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Level

## MARK SCHEME for the June 2005 question paper

### 9696 GEOGRAPHY

9696/02

Paper 2 (Physical Geography), maximum raw mark 50

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which Examiners were initially instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the *Report on the Examination*.

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**Grade thresholds** for Syllabus 9696 (Geography) in the June 2005 examination.

	maximum mark available	minimum mark required for grade:		
		A	B	E
Component 2	50	31	28	20

The thresholds (minimum marks) for Grades C and D are normally set by dividing the mark range between the B and the E thresholds into three. For example, if the difference between the B and the E threshold is 24 marks, the C threshold is set 8 marks below the B threshold and the D threshold is set another 8 marks down. If dividing the interval by three results in a fraction of a mark, then the threshold is normally rounded down.

June 2005

**GCE A LEVEL**

**MARK SCHEME**

**MAXIMUM MARK: 50**

SYLLABUS/COMPONENT: 9696/02

GEOGRAPHY

Physical Geography

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Answer **two** questions, each from a different environment

### **Tropical Environments**

Only **one** question may be answered from this environment

- 1 (a) Describe and explain the main characteristics of the climates experienced in the humid tropics, the seasonally humid tropics and in the monsoonal tropics. [10]**

The humid tropics are characterised by high average monthly temperatures (26° C) with little range. As they lie close to the equator there is little variation in length of daylight, hence little seasonal variation (daily range greater than seasonal). Ppt is 2500 - 1750 mm as a result of convection and convergence. Completely cloudless days are rare. High intensity rainfall.

Seasonally humid - movement of ITCZ brings wet weather (with equatorial westerlies) and drier weather with drier parts of trades and subtropical anticyclones. Annual temp range higher than in the humid tropics but still generally low (c. 8° C). It is the seasonal distribution of rainfall that makes these climates distinct.

Monsoonal-seasonal reversal of winds representing a giant version of a land-sea breeze system. Dry subsiding air contrasting with seasonal uplift inducing an introduction of moist sea air.

Must be some explanation for good marks **(7-10)**

- (b) To what extent have human activities affected the natural processes found in one tropical ecosystem? [15]**

#### **Level 3**

An effective choice of either TRF or savannah. Experience suggests most will choose the former. At this level, the approach should be via nutrient flows or energy flows within the ecosystem. Thus, clearance within the TRF will lead to disruption to nutrient flows and hence progressive deterioration of soils and changes to vegetation. This will lead to niche and habitat loss. Hence, species reduction and loss. Most human activities will bring this about with the possible exception of hunting gathering or long slash and burn cycles. The savannah is also subject to change through over-exploitation. Most will view the ecosystem as a plagioclimax anyway, but grassland will suffer deterioration if overgrazed or unwisely cultivated. **(12 -15)**

#### **Level 2**

A more example driven account i.e. one dependant upon examples of clearance activities - e.g. that undertaken for grazing, cultivation, plantation etc. Even so, there will be some awareness of the effects on soils and nutrient flows of these activities even if the emphasis is elsewhere. Answers at top end may distinguish between the impacts of different activities. **(7-11)**

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### Level 1

Seen as an opportunity to write the destruction of the TRF essay. No/little attention to impacts in terms of nutrients or energy flows. Generalised material relating to instances of clearance, fire etc. with no attempt to distinguish differential impacts or to identify any of the natural processes. **(0-6)**

## **2 Figs 1A and 1B show the relationship between soil fertility, the cycle of slash and burn (shifting) cultivation and population density in the tropical rainforest.**

- (a) Explain why an increase in the frequency of clearance results in a loss of soil fertility. What impact is this likely to have upon vegetation? [10]**

The sharp eyed will have noticed that the slope of the decline and recovery on the diagram is the same for both cycles - the difference is that the recovery is to an ever lower level as the cycles increase over time. Thus, the recovery period or fallow is reduced over time. As the nutrients are locked up primarily in the biomass, its significant removal leads to a loss of soil nutrients. Also decrease in cover leads to a greater amount of run off and erosion, as well as the leaching out of nutrients.

- (b) Using examples, describe the weathering processes that are found in humid tropics. Explain how these have influenced the development of landforms. [15]**

### Level 3

High temperatures and rainfall will lead to an increased rate of chemical weathering (Van Hoff). Large amounts of organic matter liberate organic acids and carbon dioxide gas, which have considerable effects upon some minerals (e.g. iron oxide). Prolonged action of chemical weathering and slow rates of erosion under TRF have led to the development of deep regoliths characterised by the deep weathering found in the humid tropics. Laterites are found where intense weathering has removed silica leaving behind residues of iron and aluminium sesquioxides. The role of deep weathering can be developed in the context of bornhardts or inselbergs. Some may choose carbonation and tower karst. **(12-15)**

### Level 2

More will be written on the development of landforms than on the weathering processes. Thus, many will launch directly into deep weathering and the production of core stones, tors, inselbergs et al. Even so, there should be some awareness of the weathering processes that are involved. This might be rather unspecific i.e. chemical processes attacking jointed areas etc. **(7-11)**

### Level 1

Little attempt to address weathering and comprised entirely of inselberg production through etchplanation and pediplanation. To pass, some recognition of at least a basal weathering surface should be evident. Similarly, in limestone landscapes, there should be an acknowledgement of the process of carbonation. **(0-6)**

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## Coastal Environments

Only **one** question may be answered from this environment.

### 3 (a) How do waves influence the shape of beaches? [10]

Waves largely influence beaches through constructive and destructive action. The nature of these waves should be described and their impact upon beach profiles, through swash and backwash, described, and examples of berms, storm ridges etc. given. Some better answers may provide a simple diagram of a beach profile. This should be well rewarded. It is possible for candidates to discuss different types of beach (bay head, pocket, barrier etc.) although they might find it difficult to relate these to wave action.

### (b)(i) Explain the operation of the marine processes of hydraulic action, wave quarrying and abrasion (corrasion).

### (ii) Briefly describe the factors, other than marine erosion, that can affect the shape of rocky coastlines. [15]

#### Level 3:

- (i) Hydraulic action is the pressure of water hitting a cliff base and the sudden release of energy which breaks down incoherent rocks.

Wave quarrying is the entrapment of air in cracks, joints etc. and decompression as water retreats.

Abrasion is the result of materials carried by waves striking cliff base giving rise to undercutting and notches.

- (i) Other factors should include, rock lithology and structure (with examples), sub aerial processes, relief, human activities and even climatic change.

**(12-15)**

#### Level 2

Marine processes should be reasonably well comprehended, although there may be some slight confusion between hydraulic action and wave quarrying. Some coverage of other factors should be given, although they will be unevenly and often only partially developed e.g. more on rock type than structure, sub aerial processes mentioned but rather unspecific. Examples of how these affect rocky coasts will be very limited. **(7-11)**

#### Level 1

Abrasion might be the only clearly expressed process, but to pass there should be some awareness of marine erosion. The other factors will be limited in scope and development. Rock type and human activities are most likely to feature in these accounts. **(0-6)**

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- 4 (a) Fig. 2 shows a theory of the development of a coral atoll. Describe the coral reefs shown and give an explanation of the theory shown. [10]**

Some description should be afforded of coral atolls which should include some reference to the fringing and barrier reefs that are seen as part of the formation process of atolls. These need only be brief but might usefully include the conditions required for coral development. Most of the account should concentrate on the Darwinian Theory of Formation. This theory postulates a progression from one reef type to another achieved by the upward growth of coral keeping pace with the sinking foundation of a volcanic island. Deep boreholes drilled through Pacific atolls suggest that the theory is basically correct.

- (b) Using examples, describe the threats that may affect coastlines and evaluate the actions that are being taken to protect coasts from them. [15]**

### **Level 3**

Threats could be described in terms of erosion, rising sea levels (coral) or human activities (e.g. interference with sediment supplies). Some depositional coastlines are fragile and can be easily destroyed by natural processes, but, equally, all unconsolidated materials are vulnerable in high energy environments. In others, coastal environments erosion is slower, but may lead eventually to sudden collapse. There is a wide range of threats so candidates can select a few well chosen examples. Similarly, protective measures should be appropriate to the threats posed and the type of coastline. At this level, an evaluation of the methods employed should feature prominently. **(12-15)**

### **Level 2**

Threats will be more vaguely defined and largely couched in terms of coastal erosion, perhaps coupled with some human activities in terms of pollution. Most of the account will be devoted to examples of coastal protection schemes. There should be some exemplification, and they should extend beyond hard engineering for better marks in this category. Any evaluation is likely to be, at best, rudimentary. **(7-11)**

### **Level 1**

Unspecific as to the nature of threats i.e. they may well be seen merely in terms of catastrophic destruction due to cliff collapse etc. The answers will be mainly comprised of examples of hard engineering types of protection which will all have been successful. **(0-6)**

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## Hazardous Environments

Only **one** question may be answered from this environment.

- 5 (a) Explain the methods used in attempts to predict the occurrence of one type of natural hazard. [10]**

A lot of choice, although many may deal with earthquakes or hurricanes.

**Earthquakes** - monitoring seismic waves through seismographs and estimating slippage along faults. Production of hazard maps etc. but still with limited accuracy. Timing is more difficult to predict than location.

**Volcanoes** - observatories (e.g. Vesuvius) observe volcanic activity, use seismographs, tilt meters etc.

**Hurricanes, tornadoes** - analysis of upper air data, radar tracking and general forecasting techniques.

**Mass movement** - tilt meters, analysis of slope composition.

**Avalanches** - weather prediction and monitoring of snow depth and structures.

- (b) Using examples, explain the hazards that may result from tropical storms and tornadoes. [15]**

### Level 3

High winds in both tornadoes and hurricanes cause destruction to lives and property. In tornadoes, houses implode and material is carried aloft. This occurs along fairly narrow tracks and hence are limited in their impact. In the case of hurricanes, it is often the secondary features that bring about most destruction which are consequences of the heavy and intense rainfall that accompanies hurricanes. Thus, flooding, storm surges, landslips etc. can wreck whole islands or large coastal areas with extensive loss of life and property. Good use of examples or example (e.g. Hurricane Mitch). **(12-15)**

### Level 2

Greater concentration on the impact of high wind speeds with the levels of destruction wrought in tornado alley and in coastal areas due to collapse of power lines, trees etc. Some awareness of the impact of other features in hurricanes, but little development of this aspect of the hazards. Some exemplification. **(7-11)**

### Level 1

Lack of any balance, with attention being focused on what are seen as the more spectacular effects - lorries being picked up and carried distances etc. Little appreciation of the general weather hazards associated with hurricanes nor of the limited tracks of tornadoes and the lack of penetration of hurricanes inland. **(0-6)**



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- 6 (a) Why are many of the world's volcanoes located in well-defined belts? [10]**

Requires an appreciation and knowledge of the role of tectonic plates and their boundaries. Good answers will show some understanding of destructive and constructive margins and their relationship to volcanicity. Weaker answers will be couched solely in terms of Pacific ring of fire.

- (b) Fig. 3 shows material erupted from a volcano. Describe the nature of the erupted materials and explain how they may be hazardous. [15]**

**Level 3**

Good understanding of the nature of pyroclastic flows and their incandescent nature. Ash plumes extending kilometres into the atmosphere with fall outs of tephra, pumice and lava bombs. Lava flows are often slower moving. Each poses different hazards and extends over different areas. High ash plumes can affect global weather patterns whilst lava flows often pose only localised hazards as well as low level ash flow. The most dangerous to human life tend to be the fastest moving materials as well as the toxic gases often released at high temperatures. There are opportunities for useful exemplification. **(12-15)**

**Level 2**

A more partial comprehension of eruptive material, although pyroclastic flows, ash and lava should be understood for reasonable marks. The hazard results will be less well distinguished between the different materials - all of them being cast in an apolyptical light. Some limited examples. **(7-11)**

**Level 1**

Lava flows will probably be the best known, with more vague references to other erupted materials. An opportunity might be taken to rehearse a known case study (e.g. Mt St Helens or Pinatabu) with the emphasis on the human consequences of volcanic eruption, rather than the hazardous nature of the materials. **(0-6)**

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## **Arid Environments**

Only **one** question may be answered from this environment.

- 7 (a) Describe the types of dune found in hot sandy deserts (erg) and explain their formation. [10]**

Most will deal with crescentic (barchan) dunes or linear (seif) dunes. These should be described (best with diagrams) and explained in terms of wind flow etc. Some might include features such as star dunes, dunes formed in the lee of barriers and transverse or straight dunes. For good marks, a range of these (not necessarily all) should be accurately described.

- (b) Describe the rock landforms that characterise hot deserts. How far can their formation be explained by processes that are operating today? [15]**

### **Level 3**

An opportunity to describe a wide range of erosive landforms from small scale products of wind erosion - drierkanter, mushroom rocks to yardangs and zeugans. Larger scale products of water erosion and weathering such as mountain fronts, mesas, buttes, wadis, and rock pediments. Some may include hammadas and desert pavements. A lot to go at, so reward good diagrams and concise accounts. Clearly, past pluvial activity played a major role in formation, although some aspects of wind erosion and water erosion (periodically) still persist in the present. An organised account. **(12-15)**

### **Level 2**

A less well organised account that tends to hop from feature to feature. Many landforms will be mentioned but often in no particular order. A partial coverage with some aspects ignored. The usual pluvial past will be cited but little/no estimate made of their continued operation. Some will merely state water erosion as a past process and wind erosion as a present feature. **(7-11)**

### **Level 1**

A mixed bag. Probably the desert piedmont will feature with both rock and sedimentary features. Descriptions will be vague and there will be little association with process past or present. **(0-6)**

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- 8 (a) Fig. 4 shows the global distribution of major world deserts and some associated climatic influences. Explain the location of these deserts in terms of the climatic influences shown in Fig. 4. [10]

Hot deserts location can be described and interpreted in terms of the climatic phenomena shown, namely subtropical high pressure, ocean currents, rain shadow effects should be identified. Subtropical highs produce descending air with clear skies and can be explained in terms of the Hadley cell. Cold currents coupled with prevailing winds cool the air stream and hence diminish moisture. Rain shadow can be interpolated from the prevailing winds shown.

- (b) What is the affect of aridity on the development of soils and vegetation in hot arid and semi-arid environments? How have human activities been affected by soils, vegetation and aridity in these environments? [15]

### Level 3

Aridity produces aridisols whose general characteristics have a low organic content and are dominantly mineral soils of an immature nature. Arid soils can be subject to leaching, whereby soluble salts accumulate at a depth related to the water table, providing one of few distinct horizons. Salt accumulation occurs more often close to, or on, the surface. This can prove toxic to plant life. Vegetation cover is low. Water controls volume and distribution of plant matter. Two classes of vegetation are evident - *perennials* (succulent, dwarfed, woody) and *ephemerals* (or annuals) which have a short life cycle after rain. Most are xerophytes and have mechanisms for gaining and storing water (deep roots, waxy leaves etc.). Humans have adapted to scarce water supplies by low densities, nomadism, concentration at oases etc. Some may develop irrigation and water harvesting etc. (12-15)

### Level 2

Vague soil characteristics but should be able to identify lack of horizons and saline characteristics. Vegetation adaptations will be individual i.e. thorns, cactus, long roots etc. with no overview. Human activities will be rather one dimensional, either nomadic or an account of making the desert bloom. (7-11)

### Level 1

Rudimentary knowledge of soils i.e. sandy and lacking in water and organic material. Similarly, vegetation will be limited to cactus type of plants. Human activities may well revolve around an account of desertification or of irrigation, much of which might be of little relevance. (0-6)