

**MARK SCHEME for the October/November 2008 question paper**

**9696 GEOGRAPHY**

**9696/02**

Paper 2 (Advanced Physical Options), maximum raw mark 50

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.

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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## Tropical Environments

- 1 (a) Explain how vegetation found in humid and seasonally humid tropics is adapted to its climatic environment. [10]

What is required is less a description of actual vegetation (TRF and savanna) and more an account of how they are adapted. The high rainfall and temperatures of the TRF encourages rapid growth and great floral abundance. Hence vegetation grows tall to seek sunlight as there is so much competition for space. Upper canopies allow the development of saprophytic vegetation which is specialised in retaining water and withstanding UV radiation. Tall trees develop buttress roots. Lianas and other species exist in the middle and emergent canopies which is partially protected from winds and intense rainfall. Even so leaves may display drip tips etc. In the seasonally humid areas vegetation becomes adapted to seasonal drought, hence long rooted grasses that die back and water retaining and long rooted trees.

Maximum of 7 marks if only one attempted.

- (b) How may the removal of forest cover in the tropics affect the rates of weathering, erosion and mass movement. What are the likely effects upon landforms? [15]

Obviously it promotes all three, but there should be some explanation of how this is achieved. Interception is removed as is the stabilising qualities of vegetation roots. Hence run off and erosion is encouraged. Bare surfaces are prone to direct weathering through both chemical and physical means. Similarly mass movements can occur due to penetration of water into slippage planes and the lack of vegetation rooting. Earth and mud flows are thus encouraged.

### Candidates will probably:

#### L3

Be able to develop a logical and structured answer that progresses from vegetation removal and the consequent impact through the various processes. Good exemplification. (12–15)

#### L2

Offer a less structured answer but still deal with each of the elements i.e. weathering, erosion and mass movement. The general processes will be understood although the effects and their exemplification will be more limited. (7–11)

#### L1

Focus attention upon forest clearance, often with much irrelevant material relating to the nature of such clearance activity. The results will be viewed as cataclysmic with total depletion of soil cover. Little attention will be paid to the processes. (0–6)

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- 2 (a) Fig. 1 shows a generalised soil profile in the humid tropics. Explain why such soils characteristically have a low content of organic matter, a richness of iron and aluminium and a vigorous process of leaching. [10]

Although the fall out from TRF is high, humus accumulation is low (top 10 cms) due to the extremely rapid breakdown of surface organic matter and its rapid leaching. Tropical soils are acidic with precipitation greater than evapotranspiration so the dominant movement of the plentiful water supply is downward leading to rapid leaching. Such soils (latosols) are red in colour, indicating accumulations of ferric compounds. The acidic water breaks down clay particles into silica and sesquioxides. The silica is removed whilst the sesquioxides are retained through ferrallitisation. Some may describe this as the process of laterisation.

- (b) To what extent is sustainable development possible in either the tropical rainforest or the savanna? [15]

The implication is that all developments in these environment are likely to be in part destructive and hence likely to be unsustainable in fragile environments such as the TRF. Candidates should be able to present examples or case studies of development schemes such as selective logging, managed clearance, wilderness tourism, safari parks etc. and give some assessment of their ecological impact and sustainability.

**Candidates will probably:**

**L3**

Give well chosen examples and an awareness of the definition of sustainability in this context. Some overall assessment can be made regarding the whole biome even though the example may be limited. (12–15)

**L2**

Subordinate the overall question, as attention will be focused on the particular example or examples of development schemes usually involving clearance of the TRF. Even so there will be some attempt at evaluation. (7–11)

**L1**

Make destruction of the TRF or setting the savannas ablaze the main focus with cataclysmic results. Little/no mention or comprehension of sustainability. (0–6)

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### Coastal Environments

- 3 (a) Outline how waves are generated and explain the effects of constructive and destructive waves on the shapes of beaches. [10]**

Waves are generated through friction between the sea surface and winds, hence the significance of fetch and wind speeds. Waves can be shown as orbital movements. Constructive and destructive waves can be described but there should be some concentration upon their impact upon beaches. Both plan and profile are acceptable but profiles are more likely from candidates.

- (b) Describe the factors that affect the rates of erosion and weathering of cliffs. Using examples, show how these factors can influence the shape of cliff profiles. [15]**

The factors should cover the usual range of high and low energy environments, sub-aerial weathering, marine erosion as well as rock type and structure. These should be explained and illustrated by reference to different types of cliff profiles. These latter can be well summarised by appropriate use of annotated diagrams.

#### **Candidates will probably:**

##### **L3**

Offer good coverage of the various factors, with attention focused on the rates. The outcomes will be expressed by sensible choice of profiles and of examples. (12–15)

##### **L2**

Describe the various processes and geological factors, with more emphasis on weathering and erosion than upon geological features. Profiles will be somewhat simplistic and often limited to slope of strata or hard and soft rocks. (7–11)

##### **L1**

Give answers dominated by marine erosion processes, with little reference to geology or to resultant profiles. Little attention will be paid to the rates of erosion. (0–6)

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- 4 (a) Fig. 2 shows a coastal spit and its dunes and saltmarsh. Briefly explain how these landforms shown on Fig. 2 have developed. [10]

A reasonably straightforward task of explaining the nature of LSD and coastal deposition, leading to the trapping of sediment as saltmarsh and the redistribution of sand into dune forms. Better accounts may make some reference to the circumstances shown in the diagram.

- (b) Why can spits, dunes and saltmarshes be regarded as fragile landforms? Describe and evaluate actions that might be taken to preserve coastal features such as these. [15]

Such depositional forms are dependent upon the operation of sediment cells and any disruption, either natural or man made can bring about their destruction. Indeed many features are subject to regular change over relatively short periods of time. The disruptive activities can be natural i.e. storms, changes to sediment transportation etc. or through human activities such as interference to sediment movement and supplies, draining, pollution etc. Actions to protect such features will range from the impact of hard engineering to the maintenance of the sediment cell.

**Candidates will probably:**

**L3**

Show an appreciation of fragility through the interlinked nature of the systems, thus saltmarshes are dependent upon the spit protection as are the dunes. The threats will be seen in this light as will be the solutions which can be illustrated by examples. (12–15)

**L2**

Concentrate on threats to the features rather than their intrinsic nature. Thus storms, human activities will be seen as the causes of fragility. Solutions will mainly be those of hard engineering. (7–11)

**L1**

Give little idea of fragility, although make some mention of destruction either through storms or more likely human activities. Groynes will be seen as the cure-all. (0–6)

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## Hazardous Environments

- 5 (a) Explain the circumstances in which slopes may be regarded as hazardous environments. [10]

When there is human occupation on or under slopes that are prone to mass movements. An account can be given of the circumstances – climatic, geological, tectonic or human actions that can bring about slope instability and failure. This could be given as series of examples. Avalanches can be included. It is the circumstances that should form the focus of the answer rather than examples (e.g. landslides, avalanches etc.).

- (b) Evaluate the methods that might be used to reduce the risks of hazards associated with slopes. [15]

The methods will concentrate upon the stabilisation of slopes. This can be achieved through vegetation or hard engineering. Planning can also contribute in the avoidance of building in or under unstable areas. Many will detail specialist activities in response to avalanche risk. It is acceptable that a particular case study is developed, even though it would not apply to all aspects of slope stability.

### Candidates will probably:

#### L3

Provide well chosen examples or case studies that give some detail of the actions taken and their cost and benefit. Evaluation will thus appear as a significant feature of the answer. (12–15)

#### L2

Give an answer which will concentrate upon the methods employed and will either be generalised and vague (e.g. afforestation) or will detail a small range (e.g. avalanche diversion fences). In either case there will be little evaluation beyond the suggestion that some mass movements may have been avoided/diverted. (7–11)

#### L1

Show little concept of slope stability or the means employed to encourage it. A hotch-potch of stray examples that may well concentrate upon the negative (e.g. don't undercut slopes, don't ski off piste etc.). (0–6)

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- 6 (a) Fig. 3 shows the location of the 2004 earthquake in the Indian Ocean and the areas worst affected by the tsunami it generated. Briefly explain how such earthquakes are caused and how a tsunami is produced. [10]

This earthquake was the result of the release of pressure along an active fault produced by the movements of the Indo-Australian and Eurasian plates. The area concerned – off Java and Sumatra – is one of violent volcanic activity and is one of the most tectonically unstable areas on earth. Earthquakes occurring on the ocean floor generate energy waves which propagate long waves. When they reach shallow coastal regions, amplitudes can increase dramatically to many metres.

- (b) Describe the hazardous effects of tsunamis and suggest ways by which they might be predicted and their effects limited. [15]

The hazardous effects are when they impact upon well populated shallow coastal areas such as those at Achea and the Nicobar Islands. Distance from the epicentre is not necessarily any protection as witnessed by severe impacts upon Sri Lanka, Maldives and Tanzania. Damage is wrought by the wave impact on buildings, flooding and salt water pollution. Subsequent hazards are produced by disease. The events of 2004 should be fresh enough to give plenty of material. Some may choose a text book example (e.g. Japan) which is acceptable. Prediction is the key to mitigation. Warning systems (e.g. in Pacific) combine sea floor monitoring and tidal gauges in buoys, as well as the means of transmitting warnings.

**Candidates will probably:**

**L3**

Give a well structured and organised account of the effects that link to the nature of the Tsunami. An awareness of the nature of prediction (i.e. earthquake prediction) as well as exemplification of either the Pacific Tsunami warning system or of that planned for the Indian Ocean. Perhaps some engineering adaptations to buildings, harbours etc. (12–15)

**L2**

Provide accounts that concentrate upon the disastrous impact of the 2004 tsunami and connect to the hazard itself. An awareness of warning systems but rather vague as to how they operate. Will not deal with prediction as such. (7–11)

**L1**

See this as an opportunity for disaster scenario, with more on the loss of life than the actual hazard. Little ideas of how warnings might be given and none of earthquake prediction. (0–6)

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### **Arid and Semi-arid environments**

- 7 (a) Describe the physical characteristics of arid and semi-arid environments that make them difficult environments for occupation by humans and animals. [10]**

The main problem is that of aridity and drought. Rainfall is low (below 250 mm) in true deserts and unreliable in semi-arid areas. In both cases it can lead to long periods without significant rainfall or physiological drought. This impacts upon the vegetation and hence both animal and human occupation. Animals display adaptation to these circumstances although this is less possible in the case of humans. Other environmental features can include: soil development, high wind environments and the impact of salinity. Better a few well worked environmental features linked to human and animal occupation rather than a list.

- (b) Using an example or examples, describe and evaluate attempts that have been made to overcome the difficulties you have identified in (a). [15]**

This may be couched solely with in terms of schemes to avoid/restore desertification. This is acceptable as only one example is required, although more may be employed therefore be avoided. Agricultural techniques of not leaving bare surfaces and the use of belts of cultivation and embankments to avoid wind erosion. Grazing control. Supplying fuel and construction material to avoid tree loss. Education. All of these might be cited. Some will concentrate on irrigation and its problems although attempts to bring degraded land into production are more difficult and costly and involve stabilisation of the surface and the control of run off as well as irrigation.

#### **Candidates will probably:**

##### **L3**

Offer a good range of preventative and restorative techniques with well chosen examples. It is possible to base the answer around a single example such as the Sahel. There should be some attempt to evaluate the effectiveness and cost of such schemes. (12–15)

##### **L2**

Give a more patchy coverage of actions, but with some exemplification. There may well be some concentration on the negative rather than positive action i.e. the restriction of population and animal numbers. A limited amount of evaluation. (7–11)

##### **L1**

Provide little beyond wind breaks and banning of grazing. Exemplification will be vague and unspecific ('e.g. Africa'). No evaluation. (0–6)

**[Total: 25]**



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**8 Fig. 4 shows a cross section of a desert piedmont.**

**(a) Identify the landforms marked A- E and give a brief description of each one. [10]**

A is the mountain front – a steep rocky slope often boulder controlled.

B is alluvial fan (bahada) a cone like accumulation of deposited material usually located at the mouth of a gorge or wadi.

C is a rock pediment – after a sharp knick slopes at a steady angle (less than 10 degrees) away from the mountain front. A rock strewn surface.

D is a peripediment of deposited sediment – clays, sands, gravels.

E is a playa lake of an internal drainage system comprising fine clays sands and evaporites.

**(b) Explain how the landforms you have identified in (a) have been formed. To what extent are they the product of past or present processes? [15]**

An account should be given of the formation of the sequence of landforms of the desert piedmont zone. This involves the action of both streamflood and sheet flood as well as the depositional elements of the alluvial fans and playa. The retreat of the mountain front and the creation of the knick should be explained in the development of the rock pediment. With the current episodic nature of rainfall there is a clear emphasis on climatic change and past erosional/depositional activities in a more pluvial past.

**Candidates will probably:**

**L3**

Give clear accounts of the geomorphological processes at work and their outcome in terms of landforms. These will be exemplified. Sensible judgement concerning the balance between current and past processes. (12–15)

**L2**

Provide more of a descriptive account than an explanatory one. Reference will be made to the work of water but it will be rather vague as to exactly how the processes have operated. It will be assigned to past pluvial periods but with no real reasoning. (7–11)

**L1**

Write in a descriptive style, with no appreciation of the nature of erosion, deposition or weathering. Possibly some features will be described, such as the playa in terms of internal drainage pattern, but there will be explanation or appreciation of processes extant in the past or present. (0–6)

**[Total: 25]**