UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced/Advanced Subsidiary Level

MARK SCHEME for the May/June 2006 question paper

9696 GEOGRAPHY

9696/02 Paper 2

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*.

The minimum marks in these components needed for various grades were previously published with these mark schemes, but are now instead included in the Report on the Examination for this session.

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UNIVERSITY of CAMBRIDGE
International Examinations

Tropical Environments

1 (a) Using examples describe and explain the characteristics of monsoon climates. [10]

Monsoon implies a seasonal shift in winds and hence in rainfall. Heating over continental interiors in summer produces low pressure areas and winds deriving from the moist oceans. This reverses in winter with the development of outward blowing winds from the high pressure over the colder land masses. The system is complicated by the seasonal shift of the ITCZ, and hence, wind and pressure belts. Examples could be chosen from India, Pakistan, S.E. Asia or China. Other possibilities will be Guinea coast of West Africa or N. Australia. For good marks there should be both a general grasp as well as an example.

(b) Describe the weathering processes that occur most commonly in the humid tropics and the seasonally humid tropics. Explain how these can produce landforms in the two environments. [15]

The humid tropics are dominated by chemical processes due to the high temperatures and rainfall encouraging chemical weathering. Deep regoliths and vegetation add organic acids which encourage deep weathering to occur along basal surfaces of weathering. In the seasonally humid tropics there is less rainfall and generally less regolith. Some may argue for mechanical processes (exfoliation etc.) in the dry season. Landforms can be those derived from deep chemical weathering (e.g. inselbergs) through processes of etchplanation or pediplanation.

Level 3: Answers will understand the impact of climate upon weathering types and rates. The nature of chemical weathering will be described and illustrated by relevant landforms (possible assisted through etchplanation or pediplanation). **[12 – 15]**

Level 2: Answers will be accounts of the development of inselbergs, kopjes, tors corestones etc. with relatively little appreciation of weathering processes. **[7 – 11]**

Level 1: Answers will either be shotgun approaches to weathering (including freeze thaw etc.) or will be vague accounts of inselbergs. Answers will be both partial and indiscriminate. **[0 – 6]**

2 Fig.1 shows the development of climax and plagioclimax vegetation.

(a) Using Fig.1, explain how the development of priseres, subseres and plagioseres have produced different types of tropical vegetation. [10]

The climax community is shown as a straightforward development from a bare surface through a prisere of plant succession to reach a climax vegetation that represents the ultimate development in terms of all environmental conditions. This could be illustrated by the development of tropical rainforest adapted to the climatic and soil conditions. Plagioclimax represents the intervention of human activities or other circumstances that bring about an alteration to the vegetation (e.g. secondary forest or savanna). Theoretically relaxation should result in a return to a climax community, but this may be inhibited by soil conditions to give rise to a subclimax community or even to bare soil.

(b) Explain how human activities may have affected vegetation and the fertility of tropical soils. [15]

This will largely be seen in terms of the clearance of tropical rainforest and the firing and grazing of Savanna woodlands. A sensible approach would be via nutrient cycles to demonstrate the impact of biomass removal or replacement in terms of nutrient stores. The resultant depletion of nutrients can lead to a progressive loss of fertility in soils with relatively low nutrient levels (e.g. latosols, tropical red soils). Some activities allied to clearance can lead to nutrient replacement through the introduction of fertilisers or a cropping system that allows nutrient replacement. Thus the answer can be linked to the diagram.

Level 3: Good use of examples of relevant human activities and an awareness of the implications within the nutrient cycle (even if not directly invoked). There will be some attention given to both soils and what soil fertility implies. **[12 – 15]**

Level 2: Will concentrate more on the human activities in terms of clearance, grazing, cultivation etc. than upon the resultant changes to soil fertility. Even so there will be some awareness of the impact upon soils even if the reasons are not well developed. **[7 – 11]**

Level 1: Seen as an opportunity for TRF clearance essay or the burning of the savannas little mention of soils or of any assessment of impact. **[0 – 6]**

Coastal Environments

3 (a) Describe the processes of wave erosion and demonstrate how they can produce a wave cut platform. [10]

Brief descriptions are all that is required of hydraulic action, wave quarrying and corrosion and possibly solution on limestone coastal areas. Their combined action in producing wave cut platforms can be shown through the usual processes of the production of a wave cut notch and the subsequent retreat of the cliff through undermining. The platform is extended but also lowered as a result of corrosion by the waves crossing it.

(b) Describe how sediment is transported along coasts and explain, with the help of diagrams, how the deposition of sediment can produce simple and compound spits. [15]

Sediment is transported along coasts primarily by longshore drift. This can be illustrated by the oblique approach of waves and their relatively straight retreat down the beach. The direction reflects prevailing winds. This can be illustrated by good annotated diagrams. Coastal spits are formed sediment transported by lsd accumulate at changes in coastal direction or where drift is held up by a river mouth or estuary. The shingle and sand is then fashioned into a projecting beach ridge which will extend to the point where sediment is removed as rapidly as it arrives (a simple spit) compound spits are those experiencing long periods of growth where the main active beach ridge is met by inactive ridges (laterals) more or less at right angles. Recurves are modified by secondary waves.

Level 3: Answers demonstrate good understanding of lsd and of deposition leading to spits. The answers will probably employ good, well annotated diagrams to illustrate both simple spits and the additional feature of compound spits. **[12 – 15]**

Level 2: Lsd will be described and there will be some awareness of where deposition takes place. The form of simple spits will be better understood than that of compound spits although the diagrams may be rather vague as to detail. **[7 – 11]**

Level 1: Lsd will be poorly understood and spits shown only “banana” style protruding from coasts. Little, if anything, will be known of compound spits. **[0 – 6]**

4 Fig 2 shows the refraction of waves as they approach a coast.

(a) Explain the refraction of the wave crests and suggest the effects of refraction upon the headland cliff and the bayhead beach. [10]

Wave refraction in this instance reflects the distortion of wave crests from an approach parallel to the coast to one that is affected by the relative depth of the sea floor. This can be produced by the configuration of the coast or the existence of shallow areas. It has the effect of concentrating wave energy in certain areas and dispersing it in others. In this case it could lead to wave erosion on the sides of the headland and to deposition as the waves lose energy in the bay head beach area.

(b) Explain the extent to which the natural characteristics of coastal dunes and salt marshes can be changed by human activities. [15]

Dune environments and salt marshes can be considered as fragile, as they can be relatively easily destroyed by both natural and human activities. Dunes represent a fine balance between erosion, transport and deposition. Thus interruptions to sediment supply or the destruction of anchoring vegetation will result in blow outs and decline. Human activities – walking, quad biking etc. can be instrumental as well as storm surges etc. Salt marshes rely on both natural protection (e.g. spits) and the unpolluted flocculation of silts as well as salt loving vegetation. Again destructive elements can stem from natural causes (storms) or from human activities such as pollution or reclamation.

Level 3: Good appreciation of fragility in terms of the balance of natural processes. Thus there will be some attempt to see human activities as destructive balanced by natural phenomena. **[12 – 15]**

Level 2: Some concept of the vulnerable nature of these coastal areas will be appreciated by the account will largely revolve around the destructive nature of human actions. Accounts may be fuller on dune areas. **[7 – 11]**

Level 1: Some idea of dune environments but little knowledge of salt marshes. Fragility will be little appreciated and human actions will largely describe leisure activities and the depositing of litter. **[0 – 6]**

Hazardous Environments

5 (a) Why is a knowledge of plate tectonics important in understanding the distribution of many natural hazards? [10]

Earthquakes and volcanoes are largely the product of activities that are occurring at plate boundaries and to a large extent, their distribution can only be explained by reference to the movement of the earths tectonic plates. Some brief description of subduction zones could be employed although a full scale account of plate tectonics is not required. Some additional hazard (e.g. landslips) can also be related to hazards occurring due to plate movements.

(b) Using the example of one type of natural hazard, evaluate the attempts made to limit its effects on the environment. [15]

The possibility exists for answers to concentrate on a single case study (e.g. San Francisco earthquake) or to produce a comparative account of attempts in different countries to counter the effects of the same hazard (e.g. hurricanes in Bangladesh and USA). Either approach is acceptable but should relate to a single type of hazard. Prediction/forecasting can be described as it allows evacuation as well as the structural adaptations and educational programmes.

Level 3: Use of a well developed case study or comparative studies (e.g. developed and developing world responses. The actions will be evaluated as to their level of success, effectiveness, cost/ benefit etc. The environment can be widely interpreted.

Level 2: Tendency to produce a list of ameliorative activities without looking at the efficacy of prediction/forecasting. Evaluation limited to success (i.e. were buildings destroyed). Environment more narrowly focused on the built environment.

Level 1: Descriptive account of a hazardous event and subsequent destruction. Some limited account of attempts at limiting impact but no evaluation. **[0 – 6]**

6 Fig 3 shows the areas of damage and the deposits produced by the lateral blast of Mount St Helens in 1980.

(a) Describe the effects of the eruption on the area around Mount St. Helens. [10]

Mount St Helens was an explosive type of eruption producing a massive lateral blast of pyroclastic material. The area of destruction (uprooted trees) indicates this. The side of the volcano was destroyed. Other hazards were induced (other than the pyroclastic material shown). These were debris avalanches produced by the violence of the eruption, extensive mudflows along river valleys from materials ejected from the volcano. Lava deposits were relatively small around the cone.

(b) To what extent is it possible to predict volcanic eruptions and to limit their hazardous effects? [15]

Prediction methods are usually based upon relatively short term prediction to allow for evacuation etc. Answers are likely to include seismic monitoring looking for earthquakes, structural loading underground temperature changes and attempts to gauge the size and growth of the underground magma chambers. Ground deformation may be studied via air photographs satellite imagery etc. or tilt meters may be installed. Monitoring of geothermal gases. These methods can be effective in the short term but are expensive. The most common response is evacuation although attempts have been made at lava diversion through barriers, use of explosives and bombs and watering of flow margins. Attempts can be made to control land use through hazard mapping or to spread the risk through insurance.

Level 3: A complete coverage of both prediction methods nor of ameliorative actions is not required. An understanding of some methods of prediction together with some adjustments to the hazard (i.e. evacuation, lava barriers etc.) should be accompanied by an assessment of their effectiveness and limitations. **[12 – 15]**

Level 2: A limited account of prediction methods displaying only a basic grasp of the methodology. Similarly a limited appreciation of human actions probably citing cases such as Mount St Helens or Etna. **[7 – 11]**

Level 1: Vague reference to predictions with the conclusion that little can be done. Evacuation the only possibility. **[0 – 6]**

Arid and semi-arid environments

7 (a) Describe and briefly explain the characteristics of climates in hot arid areas. [10]

Desert climates should be described i.e. aridity caused by precipitation totals that are generally under 250 mm per annum. High temperatures although often accompanied by large diurnal ranges due to clear skies. Thus diurnal range often greater than annual range. PET levels are high and exceed precipitation giving rise to moisture deficiencies. Deserts are often windy environments giving rise to dust storms and poor visibility. Rainfall is episodic and unpredictable and largely due to convection stemming from the high temperatures. Variations due to locations can be introduced, and should be credited, but are not required for good marks. Explanations can be sought in sub-tropical high pressure, ocean currents, continental location and rain shadow effects. These should be explained albeit in outline as to their effects upon the characteristics of hot desert climates.

(b) To what extent can human activities be blamed for the problems of sustainable management in arid or semi-arid areas? [15]

Desertification will probably be seen as the main problem of sustainable management is usually laid at the door of over population vis a vis the resources of an area. Hence removal of vegetation, lowering of water table and over grazing all encourage dessication of soils and the invasion of desert sands etc. Thus desertification is the spread of desert conditions and not merely soil degradation. This can be illustrated by a good case study e.g. Sahel. The context for much of this, however, has been longer periods of drought than is usual. Thus there are some elements of natural causes even if such drought periods do not necessarily presage long term climate change through the agency of global warming. The boundaries of the Sahara have moved south, which might be suggestive of some elements of climatic change in an arid context, irrigation and subsequent salinisation etc. will feature although there should be some appreciation of the problems attendant upon such a harsh environment.

Level 3: Some balance in the argument and awareness of the nature of desertification or the problems posed by aridity. Examples or case study is used to point up the argument. **[12 – 15]**

Level 2: An account that centres on human activities in bringing about deforestation and hence soil degradation. Some evaluation at the top end, but will not be a balanced account. **[7 – 11]**

Level 1: Seen as an opportunity to write all that is known about the Sahel in terms of soil degradation through overgrazing. **[0 – 6]**

8 Fig 4 shows some types of dunes found in desert areas.

(a) Identify the dunes shown in Fig.4 and explain how each may have been formed. [10]

The dunes are Barchan (Crescentic), Linear (Seif), and Star dunes. Dunes are accumulations of sand that have been driven by the wind and shaped by Aeolian processes. They are mobile features and can change form if wind direction changes (e.g. Barchans into Seifs). The predominant wind directions are shown and these should be employed to explain the dune shape. Hence crescentic shape of the Barchan the linear shape of seifs with wind from more than one direction and the multi-directional winds of star dunes.

(b) To what extent has running water played a major role in shaping hot arid environments? [15]

Answers can use the past/present conditions to underpin their evaluation. In the context of the present day it is unlikely that the episodic nature of rainfall would allow the level of activity required to produce major desert landforms i.e. wadis, pediments, retreating mountain fronts, inselbergs, buttes etc. Thus it could be argued that in the present context wind is the more active agent in shaping the landscape through erosion, transportation, and deposition. Even so, intense downpours although in frequent can undertake considerable work in shaping features. In terms of the origins of major landform elements, reg, sand seas, mountain fronts, pediments etc. then water activity has to be invoked. This can be associated with past pluvial activities associated with the Pleistocene and involving both water courses and sheet floods.

Level 3: There will be some balance to the argument in an attempt to assess the role of water as against other processes and the past as against the present. The argument will be for a largely relict landscape produced by water erosion that is now only being slowly modified. **[12 – 15]**

Level 2: A more straightforward account of past pluvial activity as evidenced by the landforms produced (Desert piedmont etc.). Some recognition of wind in the present. **[7 – 11]**

Level 1: Little understanding of the processes of water erosion or of the features produced. May well include archaeological and other evidence for past wetter periods. **[0 – 6]**