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Paper 2 Advanced Physical Options

MARK SCHEME

Tropical Environments

1. (a) The main controls on soil formation in the tropics is climate (especially rainfall and its seasonal distribution, topography, altitude and the nature of the parent material. Some candidates may mention vegetation, but this is generally of less influence under tropical conditions. In the humid tropics downward movement in the soil occurs through base leaching and translocation. Active weathering of parent material at depth leads to the development of deep regoliths. In other circumstances the downward movement is restricted due to seasonal rainfall or high evaporation rates or impeded drainage. . The nature of parent material is of greater influence in younger geological environments (e.g. volcanic ashes) but can be associated with weathering to produce different soil textures. Many will associate these factors with red or latosols emphasising their ferraltic qualities. Examples from gleyed soils or semi -arid calcic or salinized soils are equally acceptable. Most should be able to outline the main factors (0 –4) whilst better answers will supply relevant detail (5 –7) , but I suspect only the best will be able to illustrate them by any effective reference to profiles (8 –10)

(b) Level 3

The emphasis here is on successful management (i.e. sustainable development). At this level candidates will recognise the nature of the environment and its relative degree of fragility. Hence the significance of nutrient cycling and the stores and flows in either the TRF or the Savannah. The accounts will concentrate upon how human activities can be managed to avoid/ minimise environmental destruction. hence selected logging, plantation, limited cropping etc in the TRF and game keeping, herding, agricultural activities in the Savanna.
(15 –12)

Level 2
In these accounts the emphasis will be on human activities in the environment concerned and the relative destructiveness of their impact. Even so there will be some awareness of the nature of the environment and the types of parameters that exist to its development and hence management.

(11 – 8)

Level 1
Seen as an opportunity to write about the human exploitation of the environment with little or no reference to either management or to the nature of the environment itself. For passing marks there should be some association between the activities described and the environment concerned, albeit expressed in a vague manner.

(7 –1)

2. (a) The diagrams, although a little complex, do allow a candidate to work out the operation of the ITCZ and good answers (8 – 10) will make full use of the diagram. Thus the ITCZ results from convergence in a broad zone of low pressure developed in the confluence of the trade winds. T he zone of convergence lies roughly parallel to the equator, but moves N. and S. with the passage of the thermal equator. As shown in the diagrams the zone is characterised by convection leading to the development of convective cells. These can develop up and down drafts such that rainfall may be produced or lesser extents of cumiliform clouds. The effects are more pronounced in terms of ppt where the converging airmasses exhibit slightly different levels of humidity (eg W Africa). Some accounts will display some understanding of the ITCZ, but ignore diagrams (5 –7) whilst others will provide vague and generalised descriptions (1 –4).

(b) Level 3
Deep weathering will be explained as the operation of chemical weathering along the basal weathering surface operating at depth. This will be influenced by rock jointing, structure etc. Episodes of stripping of regoliths will be explained in terms of fluvial activity possibly conducted in wetter times in past (Savanna) or in times of vegetation removal,This can effectively be demonstrated by use of diagrams. The resultant landforms can be explained in these terms (i.e. inselbergs, ruwares , tors,koppies etc)
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(15 –12)

Level 2
Although deep weathering and regolith stripping will be briefly described,the main emphasis of these accounts will be in terms of landform production. These may well be described in some detail with accompanying diagrams although the processes will be less well developed.

(8 –11)

Level 1
Seen as an opportunity to describe landforms which will apparently arise from the earth in fully formed states. the processes of chemical weathering and of regolith stripping will be barely referred to , let alone explained.

(7 -1)

Coastal Environments

3. (a) Descriptions of hydraulic action, wave quarrying (cavitation) and wave corrasion and solution should be given. Better answers may illustrate these processes by reference to features produced e.g. undercutting of cliffs, geos, karren type features etc. This is not necessary, however , for good marks. Cliff recession leading to the development of wave cut platforms can be described, but better answers will illustrate with appropriate diagrams. The nature of the erosion process (largely corrasion) and its effects in etching out lines of weakness will be explained in the better answers (8 -10) whilst the association of process and feature will be less distinct in other answers(5 –7).

(b) Level 3.
Candidates can be expected to describe with diagrams the three main types of coral reef, i.e. fringing reefs, barrier reefs and atolls. Some may show these as composite diagrams related to theories of reef evolution. The nature of the different types will be adequately described in terms of bottom growing coral, lagoons, and the parallel nature of barrier reefs (e.g. Great Barrier Reef) along wave cut platforms and fringing reefs, which are attached to the shore or separated by a shallow lagoon. Theories of development may well concentrate upon the Darwinian theory of subsidence or sea level rise associated with volcanic islands. Some awareness will be demonstrated of other interpretations (i.e. Daly, Murray, etc)
(15 – 12)

Level 2
The types of reef will be described and shown diagrammatically although with less detail. Theories of formation will largely be Darwinian but there will be an awareness of the significance of sea level change and its possible causes.
(11 – 8)

Level 1
Outline accounts of coral reefs with greater dependence on the classical atoll type. Sea level change will be cited as causal but with little knowledge of the mechanisms or the effects. Diagrams will be simplistic and outline.
(7 -1)

4. (a) The named features of the beach profiles should be described and given brief explanations for good marks (10 –8) . Hence the beach ridge is an accumulation of sediment here about two meters high and often developed in coarser sediments (e.g. shingle) at the top of the beach. They are accumulated by storm waves which are constructive in that they push material up the beach. Successive ridges mark different storm events. Berms are similar features but are accumulations of sand. Bars are offshore features here shown as accumulations of sediment c 1 –2 metres high from gently shelving coastal area and are dropped when the waves lose energy.
The different profiles relate to different wave conditions – the high energy storm waves accumulating ridges and removing bars and berms and the lower swell conditions allowing for beach accumulation.

(b) Level 3
Candidates will deal with the coastal environment in general looking at a wide range of activities. This could be anything from settlement to conservation activities in the broadest of senses. These activities will be related to the marine processes and their subsequent environmental impact. There is an opportunity, for instance, to develop human impact upon coral reefs. Good use of example (s) or case studies with some overview.

(15 – 12)

Level 2

Human activities seen in a more restrictive sense as bringing about coastal protection often expressed in terms of hard engineering. Examples will be cited and their will be some association with marine processes and environment but these will often be weakly developed.

(11-8)

Level 1
Coastal protection schemes or the destructive power of human activities (via construction, tourism etc). These will be expressed in vague terms with few if any specific exemplification. Little reference will be made to physical environments.
(7 –1)

Hazardous Environments.

5. (a) Candidates should explain the development of hurricanes in terms of sea temperatures , humidity, coriolis force bringing about the development of rapid vertical uplift around a relatively calm eye. Tornadoes develop as intense low pressure centres associated with layers of warm moist air at low altitude with a layer of dry air at higher altitude leading to a temperature inversion at about 1000m. Weaker candidates will confuse the two phenomena or merely describe the effects (i.e. high winds, twisters etc)

(b) Level 3.
Prediction can be developed in a number of different hazards although only two are required. Earthquakes can be predicted through tension along fault lines, tilt meters etc and volcanic eruptions through seismic activities, temperature monitoring etc. Do not expect distinctions to be made between forecasting and prediction thus satellite imagery of hurricanes, tornadoes are acceptable as is wave monitoring of tsunami. Some hazards are very unpredictable (e.g. landslips) . The nature of the answer will depend upon the hazards that are selected. The indicator of this level of answer will probably be expressed in terms of the evaluation of the success of the methods described.
(15 –12)

Level 2.
Descriptive of particular events with an explanation of the attempts at prediction. Evaluation will probably be in terms of the outcomes of the hazardous event rather that a more generic type of assessment. There will be some appropriate use of examples
(11 – 8)

Level 1
Descriptive of two types of hazard with only a vague idea of the methods employed to predict them . There will be little evaluation and many hazardous event will merely be viewed as inevitable catastrophes. Effects of such events may well feature as parts of the answer.
(7 –1)

6. (a) The distribution of both earthquakes and volcanoes display an association with plate boundaries. Hence the "Pacific ring of fire". However these plate margins

should be distinguished between constructive mid ocean ridges visible in the Atlantic and Pacific oceans as against the destructive (subducting) margins e.g. along W coast of the Americas. Good answers will offer some explanation of differences (10 – 8). Also it can be noted that earthquake zones extend far beyond margin areas covering wide areas of structural instability. The most hazardous areas are those where the hazards coincide with areas of dense populations (egs can be selected from map) Also where local geological circumstances can bring about particularly large hazardous events.

(b) Level 3
The main variable to be considered here is the socio – economic position of the population involved given equal severity of hazard. In circumstances of relative affluence the ability to predict, take ameliorative action and to move vulnerable populations is far greater than in poorer nations. Contrasts can be made between such things as cyclones in USA as against the Central America, or Bangladesh. Earthquakes in California as against Turkey or India, Volcanic eruptions at Mt St Helens etc. A selection of these examples will be used to illustrate the sorts of measures that can be taken to mitigate effects although there will be some realisation that despite all precautions local physical circumstances still produce major hazardous impacts (e.g. Japan)
(15 – 12)

Level 2
Comparisons will be made of similar hazards in terms of impact and assigned to relative wealth, poverty etc of populations affected. The reasoning behind this (i.e. prediction, prevention, retreat, management) will not be as well developed or fully spelled out. Little attention to local physical conditions will be evident.
(8 –11)

Level 1
Basic descriptions of hazardous events and their aftermaths with relatively little indication of the underlying causes of the differential effects in terms of loss of life and property. The differences will just be vaguely assigned to different levels of development. Examples will be poorly developed
(7 –1)

Arid and semi - arid Environments

7(a)
The main types of weathering are those of thermal fracture and chemical weathering. The operation of these processes should be explained. good answers will point o the slowness of such processes yet the large amount of detrital material that exists in these environments. Clearly this could not be the result of only thermal fracture in the present. Much of the detrital material displays evidence of chemical weathering.

(b) Level 3
Candidates will make good us of case studies or examples (plural or single) to illustrate the limitations imposed by lack of water, climate, hydrological regime, topography and often remoteness. This usually leads to low carrying capacities and

stringent limits on development.. The means of overcoming these limitations are often themselves very limited and dependent upon vast investment often yielding low returns. Technology often exists but can only be afforded in circumstances where her are vast mineral resources (oil) to be exploited or there are strategic considerations (e.g. Israel , Death valley etc)
(15 –12)
Level 2
Attention focussed on examples of schemes to develop arid areas with less awareness of the limitations The examples will be reasonably described but the limitations will often be implicit rather than explicit and will be largely contained within the context of success or failure.

(11 – 8)
Level 1
Examples of human activities in Arid or semi arid areas (e.g. Sahel) in a descriptive manner with generally causes ascribe to human activities themselves. Overgrazing, overcropping, soil erosion etc. These , however, will not be tied into environmental limitations per se and will remain rather outline and descriptive.
(7 –1)

8. (a) The first part of the question is to describe the features from the diagram testing interpretative skills as well as knowledge The mountain front is a steep slope (over 30 degrees) rising abruptly and often boulder controlled. The pediment is a gentle concave slope appearing to be planed across the rocks although sometimes veneered by a thin layer of sediment. The peripedement is a broad zone of alluvial sediment. The explanation of the retreat of the mountain front and the formation of the pediment and peripediment can again in part be interpreted from the diagram Stream floods emerging from the embayment undercut the mountain front leading to active extension of the pediment through the pediment embayment. Material is transported across the pediment to the peripediment.

(b) Level 3
Plants animals and soils have become adapted to the harsh climatic and environmental conditions largely through adaptations to resist lack of moisture and fierce heat. These can be illustrated through individual examples or within the context of the development of a distinctive ecosystem. Zerophytic plants with long root adaptations, nocturnal animals adapted to harsh conditions and solanchak soils. Good use of exemplification and awareness of variations within arid environments
(15 –12)

Level 2
Descriptive accounts of vegetation and soils within arid conditions with some reference to animals. There will be some appreciation of the nature of the adaptations although these will be limited to such things as water retention , xerophytic etc. Soils will be seen as unstructured and saline.
(11-8)

Level 1
Descriptive and rather isolated examples of desert plants, animals (camels etc) and soils . The latter will be described as sand or infertile, Little link will be established to

either the environment or the ecosystem and the account will be generalised and vague.

(7 –1)