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Paper 1 Global Environments

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MARK SCHEME

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Section A

Answer **one** question from this section.

Hot Arid and Semi-Arid Environments

1 Fig. 1A shows four different types of sand dune found in hot arid environments.

Fig. 1B is a table describing four different types of sand dune.

- (i) Match each sand dune type in Fig.1A with the letter of the appropriate description given in Fig. 1B. [4]
- (ii) Explain why any two of the sand dune types shown in Fig. 1A are different in form. [6]
- (i) W = III
X = IV
Y = II
Z = I [4]
- (ii) The explanation for each of the types chosen should focus on sand supply and on wind direction. The explanation should include some comment on the form of the dune for maximum marks. [6]

(b) EITHER

(i) 'Management strategies in hot arid and semi-arid environments are essential.'

To what extent is this a valid statement? [15]

The management is essential (an idea which should be addressed) largely due to climate extremes. These should be outlined and their impact on the physical environment made clear. Although populations may not be large for this reason, there has been an increase and this creates more threats to the limited resources. A broad question so that use of case studies will enable candidates to organise an argument effectively. The nature of the management, in terms of agriculture and all the other economic activities as well as social implications can be included.

Higher level answers will define their choice clearly, almost certainly frame their responses within a case study or case studies or there will be use of examples to illustrate both the extremity of the physical environment, the strategies adapted and the reason for them. Both environments requested will feature to a greater or lesser degree. The examples may involve both mitigation and adaptation. This would be an excellent response commanding the highest marks.

Lower level answers will not have as many geographically specific references, will not be well organised and will recognise some management strategies but fail to write a convincingly persuasive argument. The conclusion may be weak as it does not relate back to the question nor see into the future.

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OR

- (ii) 'The traditional lifestyles of societies that inhabit hot arid and semi-arid environments have been subject to change in the last 50 years.'

Discuss the extent to which these changes have compromised their lifestyles. [15]

The answers will be different according to the societies chosen but should encapsulate ideas about how and why changes have occurred in the last 50 years. These changes may have come from within and without the society and the impacts made clear. Some candidates may offer suggestions or predictions for the future survival of these distinct ways of life.

Higher level answers will not only be able to describe the past lifestyle but demonstrate the range of impacts that have occurred, suggesting that they are internal or external with internal implications e.g. climate change is an obvious one, globalisation is another. The answers will be framed within well-known societies and discuss changes brought about by both physical and human factors.

Lower level answers are less factual and located less firmly within chosen societies. There may be allusions to both physical and human causes of changes but these are not well delineated. Generally the material will not be well organised and the conclusion will not summarise convincingly.

Glacial and Periglacial Environments

2 (a) Figs. 2A and 2B show information about the velocity of a glacier.

- (i) Describe the horizontal and vertical profiles shown in Figs. 2A and 2B. [4]
- (ii) Explain how and why the profile shown in Fig. 2B helps to demonstrate the nature of glacier movement. [6]
- (i) Fig. 2A shows that movement decreases with depth gradually to about the mid-point of the glacier. After that it decreases with depth more rapidly. Approximate figures should be included to provide evidence of reading the graph. The horizontal profile shows that the movement decreases with depth very slightly and then at about 150m-plus the decrease is sudden, exponential and then continues to decrease more gradually to a depth of 200m at the base of the glacier. Again, figures from the graph should be included for full marks.
- (ii) The vertical profile demonstrates the concept that increasing pressure with depth causes a greater rate of movement in the middle of the moving ice. Often this is likened to squeezing toothpaste through a tube as the same volume of ice is being pushed through an increasing confined space like a tunnel. Candidates should be able to quote figures from the data and give an accurate indication of the velocity profiles.

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(b) EITHER

- (i) Discuss the significance of the active layer in the formation of periglacial landforms. [15]**

The word 'significance' is the important one in this question so candidates should address this issue. However, they may construe it in whatever way they choose. The active layer should be defined and described and the implications of a saturated, narrow, superficial layer of soil overlying permafrost made clear in terms of the outcomes, i.e. the micro features and landforms that appear in the landscape e.g. involutions; ice lenses within the ground, polygons; patterned ground' pingos and thermokarst landscapes.

Higher level answers will outline the seasonality of the active layer, describe it in detail including ground ice and its forms and roles, and then consider a range of outcomes the best answers will recognise scale and see that landscapes as well as landforms may be produced. The conclusion will consider the question of what is meant by significance.

Lower level answers will know less about the outcomes to the active layer, may well omit the idea of seasonality and fail to address the issue of their meaning or significance adequately. Diagrams will either be absent, sparse or not well integrated into the text.

OR

- (ii) Discuss the extent to which environmental, political and economic issues may influence management of glacial and/or periglacial environments. [15]**

A broad question that is limited by the choice of environment. The physical environment should be discussed, its nature and constraints and opportunities it offers for a range of activities. Political issues are specifically related to the Antarctic, although there are also political considerations in decision-making about the exploitation of resources in these fragile environments. Specific geographical locations should form part of an integrated argument. None of these issues can be separated in reality so it is necessary to credit those candidates who can recognise the complexity of them and the interrelationships between them.

Higher level answers demonstrate the awareness of interrelationships, use well-located appropriate case studies and may well find some illustrative material too. All three areas are covered even if the breadth of the question precludes a comprehensive survey. The conclusion will reflect the question and the best will possibly offer some element of prediction for the future.

Lower level answers will contain less detail throughout, may not be strong on one or more of the issues contained in the title. Often the examples will not be well developed or even mentioned.

It is a broad question hence the need to be realistic about comprehensive coverage. Often the distinction between a good and less good answer will be clear from the way the argument is structured and the conclusion reached. In the case of lower level answers, the conclusion is vague and does not convince in terms of which issues are paramount both in the present and for the future.

Answers will be defined by the choice of either glacial or periglacial environment.

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Coastal Environments

3 (a) Photograph A shows an area of coastline. The landform found at X in Photograph A is a spit on the south coast of England.

(i) Describe two features of the spit shown in Photograph A. [4]

(ii) Explain how the spit shown in Photograph A may have been formed. [6]

(i) There are a number of points that can be made. Credit correct features such as recurved end in open water, longish, narrowish, sand dunes, marshland behind the spit. However, without the idea that one end is in open water and the curve or recurvature it will be difficult perhaps to achieve full marks. 2 marks for each correct identification and description.

(ii) Formation. Longshore drift from the east north-east. Supplementary winds from the south/south-east and perhaps the south-west reworking the material inland across the change in the direction of the coastline/inlet (a harbour in this case-Chichester). Currents within the inlet may help rework the material but as the material builds up mudflats will accumulate and then marsh will develop as plant colonization begins. Sand dunes and an incipient cuspedate is developing at the distal end suggesting LSD from more than one direction. Some attenuation at the southern end due to the installation of groynes cutting off the sand supply. There are many points that can be made and good candidates may include a sketch diagram to aid their answer.

(b) EITHER

(i) 'Haloseres are being degraded by economic development.'

With reference to coastal ecosystems, discuss the arguments for and against this statement. [15]

Haloseres are fragile highly-threatened coastlines which may be tropical or temperate. They are vulnerable to climate change and human activities. Often they are associated with densities of population and both are susceptible to increased sea levels and storms.

Case studies could underpin the answers and all the threats environmental, economic and political will be discussed in relation to the choice of study. Salt marshes in the UK could make a useful contrast to the reefs of the tropics in terms of biodiversity and approaches to protection, perhaps even at different scales.

Higher level answers are familiar with both marine ecosystems, can describe them in terms of their characteristics and their fragility and the external threats to them. Their fine balanced functioning will be made clear perhaps via diagrams. The conclusion, whilst not fully comprehensive, may be broad enough to demonstrate an understanding of the issues.

Lower level answers are characterised more by a skewed answer or lack of knowledge. Equally they may have knowledge of both systems but be unable to discuss the fragility and the threats in sufficient detail to produce convincing evidence of understanding. The material will not be organised and the argument inconclusive.

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OR

- (ii) To what extent is hard engineering the preferred option for the management of coastal environments? [15]

There will be an outline of management strategies for coastal protection, both hard and soft engineering and perhaps an acknowledgement at the beginning of the preferred option now by the Environment Agency in the UK for 'managed retreat'. Certainly awareness of this option and the reasons for it and what constitutes managed retreat is an essential part of the answer. Hard engineering is likely to be the focus of many answers but a blow-by-blow account of each method is not required. A number of methods might be usefully illustrated but at least half the answer or more should focus on alternatives i.e. hard engineering; answers should centre on an argument about effective coastal protection and the reasons for the need for it. Those reasons may be intensifying given potential climate change and its implications. All these aspects could/should be included.

Higher level answers will see all the implications of the questions, be factually sound about hard and soft and the comprehensive reasons for managed retreat. Diagrams will undoubtedly be presented as part of the argument and some case study material may well appear. The best conclusions will cover all aspects of the question and speculate about the future of the coastline. They may include overseas locations as well as those in the UK.

Lower level answers will devote most of their answer to a panoply of hard engineering strategies that may well be detailed and well-illustrated. However, they will be less strong on alternative strategies, it will contain a flimsy argument which will not be evaluative. Strategies like realignment may be absent altogether.

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Section B

Answer **one** question from this section.

Tropical Environments

4 (a) Fig. 3 is a series of cartoons about human impact on tropical rainforests.

- (i) Name the type of cultivation shown in Fig. 3, identify the inputs and briefly describe the process of cultivation portrayed in Fig. 3. [4]
- (ii) Explain the relationship between this type of cultivation and population densities in tropical rainforest environments. [6]
- (i) The cartoon describes shifting cultivation in which the farmers move from place to place deforesting in the process; when the soil has lost the small amount of the fertility it possesses, the farmers move on to clear another patch of forest. They could mention that it is subsistence, that it has low inputs and the processes should be emphasised: felling, burning, fertilization with ash, planting and harvesting. There needs to be information which is beyond the scope of the information given otherwise they are merely copying from the cartoons. Good candidates may include time frames; this is not essential but credit the overall explanation and appreciation of the system rather than looking for individual points. [4]
- (ii) The answer should show awareness of shortening the time between clearances, the lack of restoration of fertility to the soil; the fact that leaching and soil erosion causes loss of fertility in soils that had little intrinsic fertility at the outset. Nutrient cycles are broken because there more people dependent on the forest resources. In addition, there are larger areas of forest cleared in any one area, so the rain causes more problems as larger expanses of land are cleared. Forest regeneration becomes increasingly difficult. Again, award credit for an understanding of the relationship between the population and the resources and the ability to manage the ecosystem. [6]

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(b) EITHER

- (i) **'The greatest biodiversity in a tropical rainforest lies in the canopy layer.'** Discuss the validity of this statement. **[15]**

There is some controversy about the location of the greatest biodiversity in the TRF. Some scientists consider it lies in the upper echelons of the trees, others suggest that the plethora of microorganism in the soil opposes this view. Perhaps candidates will not be aware of such an argument, but reward those who include it. To write a good answer some awareness of the meaning of biodiversity is essential. Awareness, too, of the relationships between animals and plants is essential. Knowledge of the ecosystem, it's functioning and the possible threats to it could/should be included.

Higher level answers will be able to name species, show knowledge of the canopy, how and why the fauna and flora is diverse, use appropriate terminology and demonstrate specific ecosystem knowledge like adaptation ecological niches etc. They will contain much of the indicative content, handling the concept of biodiversity as the underpinning of their answers and draw a conclusion that reflects the fragile nature of the environment.

Lower level answers may contain factual detail but with less awareness of terminology and concepts such as ecological niches, and do not suggest that there is an inherent fragility in these environments. Their conclusions tend to be factual rather than extend to concepts.

OR

- (ii) **Consider the ways in which tourism may be used to maintain the sustainability of tropical rainforest environments.** **[15]**

These answers should begin with some ideas about tourism, as it is the subject of the question. The object is sustainability. Therefore, an acknowledgement at the outset that there are other ways of achieving sustainability of which tourism of the appropriate sort could contribute to the aims. Reasons for increasing demands could usefully include Ecotourism, which may be the popular choice for discussion, using effective examples and or case studies to underline the points made. However, it is essential that a significant proportion of the answer makes reference to other solutions as contributing to sustainability.

Higher level answers will contain details about tourism causes, of increasing demand types and application to TRFs. Case studies will illustrate general principles and at least several other solutions will feature in order to maintain or at least try to retain the integrity of this fragile ecosystem. Conclusions will tend to look to the future. Illustration may be more difficult, although maps showing strategies and schemes can be used and integrated and discussed in the text.

Lower level answers are probably good on ecotourism, may be able to detail schemes, but they do not include a discursive element, do not see many alternative methods of management and do not recognise the fragility of the ecosystem. The conclusion is unlikely to project the future and does not recognise all the implications of the question.

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Temperate Environments

5 (a) Figs. 4A, 4B and 4C show nutrient cycling for three temperate ecosystems.

(i) Identify the ecosystem for Figs. 4A and 4B and give one reason for your choice in each case. [4]

(ii) Using Fig. 4C, explain the nutrient cycling shown. [6]

(i) Fig. 4A is a boreal forest and Fig. 4B is steppe, Fig. 4C is deciduous forest. The obvious reasons are likely to be contrasting energy flows and stores within and between the ecosystems. Energy flows and stores in the boreal forest are low and small whereas the steppe has higher flows and larger stores with the soil store dominating, although the biomass is small, i.e. dry grassland. (That could be enough for two marks. The nutrients are recycled and held in the soil because there is seasonal loss of grasses and rapid breakdown helped by precipitation. There should be one clear reason for each ecosystem). This needs to be brief otherwise they will repeat themselves in part (b). [4]

(ii) Candidates should consider stores and flows both within and without the system. Full marks cannot be awarded if weathering, leaching and precipitation, are not mentioned. They do not need all of them but some inputs are needed. [6]

(b) EITHER

(i) 'Some temperate ecosystems may be considered plagioclimax communities'. With reference to at least one temperate ecosystem, discuss the arguments for and against this statement. [15]

Define a climatic and plagioclimax community at the outset. Candidates may try to cover temperate deciduous forest enabling them to include heathland and moorlands. Often called moorlands at high levels. Moorlands exist as climatic climaxes above 750m. The reason may be covered. They can vary from wet to dry heath depending on depth of peat beneath. They are also highly managed extensive ecosystems as they have replaced deciduous forest in the UK. These are controlled by a number of factors, often grazing and burning. Details of the nature of such ecosystems should be included and the ways in which they are managed discussed. In the conclusion it would be ideal if candidates could come down on one side or the other backed up by the evidence provided.

Steppe and boreal forest are the other options but if they are sensible they will attempt both as there may be less to write about each depending upon their knowledge.

Higher level answers will be unequivocal in their presentation of the characteristics of such vegetation and knowledgeable about the subject. They will be aware of the meaning of plagioclimax and be able to argue a convincing case. Conclusions will address the question directly and perhaps offer predictions for the future of these scenically valuable ecosystems for the future, given the intensity of use they receive in the 21st century.

Lower level answers will be vague about any distinction between the two and not completely aware of the way in which they are used. Little specific location, characteristics are vague, although they can probably discuss use a little they will omit other uses like walking, tourism etc. and the nature of these environments when under threat.

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OR

- (ii) 'The distribution of temperate deciduous forest is the result of precipitation and temperature.'

How far do you agree with this statement?

[15]

Two considerations need to be addressed in this answer. The distribution of the forest in the UK, the nature and extent of the response to the climate to produce a climax and then the arresting factors which may subdue the climatic climax and produce plagioclimaxes and sub climaxes. Some interpretation of 'local' would be useful, the range of arresting factors and the way in which the vegetation differs in response to different inputs. Human management may be national but is often local, i.e. management strategies of the non-governmental organisations or government schemes which should be named. The latter should be stressed.

Higher level answers will contain climate figures and the details of the constitution of the forest ecosystem and its functioning. From there the answers will broaden out into consideration of the general principles of the development of an ecosystem in order to demonstrate the operation of arresting factors. These will be linked to some specifically located examples.

Lower level answers will know something of the forests and be able to demonstrate variations locally although the sense of 'local' may not be clear. What may well be lacking is the underpinning theory of the development of an ecosystem and the way in which arresting factors may operate. The weaker candidates may not recognise that other 'local' factors which may include human management are known as arresting factors in plant succession. The conclusion may indicate that the candidates do not really quite grasp the importance of plant succession and climax and plagioclimax in this answer.

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The Atmospheric Environment

6 (a) Fig. 5 shows an extract from a blog on the internet in which the writer is expressing views about global warming.

(i) Define two of the terms underlined in the extract. [4]

(ii) Briefly explain why adaptation to global warming may be preferable to mitigation. [6]

(i) Define any two of the terms underlined in Fig. 5.

The relevant terms are: global warming i.e. the global increase in the temperature of the atmosphere by natural and/or human processes; renewable energy: resources that do not decrease over time but recreate themselves, are part of a continuing cycle, e.g. water, wind etc.; IPCC is a UN organization that is responsible for the global monitoring of changes in the climate and assessing the latest scientific research on the atmosphere and its changes. [4]

(ii) Adaptation suggests adapting to higher temperatures which may be expensive in the short run but will change lifestyles, the economic and social environment. Mitigation will involve finding alternative sources of energy and using fewer resources which emit carbon dioxide and some of the other noxious polluting gases. Carbon trading and legislation could also be included. Broad answers as well as in-depth detail could be part of successful responses but once again a structured, well concluded answer with evaluation will characterise the best responses. There are 6 marks so the candidate should demonstrate awareness of the meaning of both mitigation and adaptation. [6]

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(b) EITHER

- (i) To what extent are the short-term variations in the weather of the cool temperate western maritime climate the result of low pressure zones (depressions)? [15]**

The climatic characteristics of the western cool temperate maritime climate should be outlined. The four words of description should be covered together with some statistical information. The causes and reasons for the climate will be the starting point for addressing the question. Upper atmospheric movements will be an essential part of these that will include the latitudinal implications of unequal global heating such as surface wind and pressure belts. Awareness of the simplicity of the statement should be recognised and candidates need to see the significance of periods of high pressure and the greater extremities of the weather that is associated. E.g. summer anticyclones and potential heat waves and winter anticyclones with attendant low temperatures, frost, fog and intense cold and snow. Candidates should make clear the meaning of the word weather, as it is within the umbrella of this climate that the discussion should take place.

Higher level answers will make this distinction, understand some of the complexities of the physics of the weather i.e. upper air circulation as well as surface conditions. The answers are comprehensive, demonstrate analysis as well as knowledge. The best candidates may offer a future scenario of more extreme weather, greater intensification of storms and increased winter rainfall if climate change continues, at apparently, present rates.

Lower level answers are probably good on the factual details and will describe the weather associated with both low and high pressure conditions. However, they are unsure about jet streams etc. and tend to describe rather than explain, demonstrating a lack of understanding. Conclusions may be a repeat of the content in brief.

OR

- (ii) Discuss the extent to which ENSO events have an impact beyond the Pacific region. [15]**

Like most questions there are two initial demands here. The first is knowledge of ENSO events. There should be detail about El Niño and La Niña, their cyclical nature and how they operate in the Pacific Ocean. Without this factual base the answer will have no credibility or locational detail.

The sense that the atmosphere is a global envelope and that when there is a change or event in one part of the world, because of global circulations, it may well have implications for elsewhere. The term is 'telecommunications' which could be usefully employed as the concept underpins the answer.

The climatic implications such as increased/decreased rainfall; increase in severe storm events; droughts, monsoons etc. are part of the answer but the economic, social, political and environmental considerations must be addressed too.

Higher level answers contain all the necessary facts, can demonstrate the extent of the impacts globally, and can quote some statistics to support their arguments. Diagrams of the seasonal variations in ENSO events and the distortions when an El Niño and La Niña event occurs will greatly enhance the answer and these candidates will include them.

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Lower level answers are not well informed although there are some sketchy diagrams and some knowledge. They find the application of the ENSO events and the distortions less easy to articulate so the answers tend to be partial. Conclusions are unclear in terms of the teleconnections. They are not convincing about the climatic and further consequences of these events.