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FOREWORD

This booklet contains reports written by Examiners on the work of candidates in certain papers. **Its contents are primarily for the information of the subject teachers concerned.**

ENVIRONMENTAL MANAGEMENT

GCE Advanced Subsidiary Level

Paper 8291/01

Paper 1

General comments

This session saw the first session of this new examination paper titled Lithosphere and Atmosphere. This paper forms the first of two papers aimed at formally examining aspects of the Environment Management Syllabus. This examination paper falls into two sections:

- **Section A** which contains short answer data response questions, draws upon many features of the old Environmental Science examination and examines a candidate's understanding and knowledge of the element of the syllabus.
- **Section B** comprises three essay styled questions of which candidates have to choose one. The aim here, is to pick up issues that are appropriate to the syllabus modules and provide candidates with an opportunity to develop their own ideas, knowledge and experience.

Thus, hopefully, Centres will have viewed this paper as being a blend of the old and the new.

In the main, the response to Paper 1 has been extremely positive. Most candidates found the 1½ hour time allocation sufficient and used their time well; there were some lengthy essays in **Section B** and very few incomplete papers. Generally essays were well constructed and the majority of candidates seemingly had little difficulty with their written English. Performance across the paper was a little uneven, **Section A** posing more difficulties than **Section B**.

Candidates adhered to the front-page instructions and there were no instances of rubric errors i.e. answering more than one question in **Section B**.

Comments on specific questions

Section A

Question 1

This question was derived from Key Questions 1 and 2 of the syllabus and was concerned with seismicity, earthquakes and earthquake damage mitigation. Responses were quite varied with marks ranging from 3 to 20.

- (a) The theme of this part involved the nature of seismic waves and how they are used to unfold some aspects of the Earth's structure and their use in locating earthquakes. Whilst a small number found few difficulties with the five parts to this question, many found it difficult. For many the simple definition of seismic waves being shock waves generated by an earthquake was not always followed up by an understanding of the nature of P, S and L waves. It follows that some poor answers to (i) and (ii) led to weak answers to (iii) and (iv).

There were a significant number of very good responses to this first section and some very accurate descriptions of how information from more than two seismic stations can be used to locate an earthquake; in these cases effective use was made of annotated sketch maps.

- (b) This utilised the theme of an earthquake. Parts (i) and (ii) were well answered with most candidates having a clear understanding of focus and epicentre along with the characteristics of surface L waves. There was some uncertainty as to how these waves affect areas of loose and compact materials. Loose materials such as lake sediment (Mexico City's foundation) shake and can produce liquefaction thereby causing a lot of damage whilst compact material may reveal little impact.

- (c) There were some good descriptions of how buildings can be constructed to reduce damage, inflicted by an earthquake. Such answers focused upon deep foundations, flexible building height; it was not relevant to suggest that buildings should not be constructed in earthquake prone regions.

Question 2

For many candidates this proved to be a difficult question and responses revealed many of the difficulties found in the former Environmental Science paper. It seems that candidates do find the Atmosphere section difficult even though the examination questions focus upon quite fundamental processes and in the case of the Hurricane a major and recent event.

- (a) Whilst there were some very full and accurate answers to parts (i) and (ii) some weaker candidates made no attempt. Global pressure systems and related air mass movement are fundamental to understanding world weather and climatic systems and an important feature of Key Question 2 in the syllabus. It would be unfair to ignore the fact that there were some very good responses to these questions expressing a clear understanding of differential heating of the Earth's surface leading to air moving from areas of high to low pressure; deflected of course by the Earth's rotation. Although more difficult, these candidates then described how the summer continental low pressure system drew air in from surrounding areas, thereby disrupting the global pattern shown in Fig. 2.1.
- (b) Few difficulties were encountered in this part of the Atmosphere section. The expression 'pattern of temperature and rainfall' was correctly interpreted and the impact of both a maritime location and the cold Californian Current upon San Francisco was well answered by most candidates.
- (c) Responses to this question based on Hurricane Mitch proved to be very disappointing. It seems that candidates did not understand the term 'weather events' nor the succession of weather that would have been experienced as a hurricane passes over. Additionally this question utilised a satellite photograph; a type of resource that has been used in previous Environmental Science examinations.

Section B

This section involves the selection of one question from a choice of three. Each question contains a part (a) that is worth 10 marks and aims to set the scene for a 30-mark essay. Part (a) in each of the questions can involve either data response questions or short answer descriptions or definitions. The 30 marks essays focused upon environmental management issues giving candidates the opportunity to utilise exemplar derived from their personal experience or studies. The questions for this examination comprised:

- an atmospheric pollution question derived from Key Questions 3 and 4 in the Atmosphere module
- a soil formation and soil management question derived from Key Question 4 in the Lithosphere module
- a resource and resource management question derived from Key Question 5 in the Lithosphere module and Key Question 5 in the Atmosphere module.

Question 3

The data in part (a) and the opportunity to use case studies elicited some very good answers to this question which was based on air pollution in urban areas.

- (a) Candidates opted for one of two approaches to the pie charts on air pollution in four cities; both of which are valid. Some drew comparisons by giving each city separate consideration whilst others achieved the same end by reviewing the various forms of pollution. Although a more difficult approach the latter did produce more succinct answers whilst a separate city treatment sometimes became repetitive.

As indicated earlier there were some very good responses to this part, often achieving the full 10 marks. The main concern was with the amount of time spent on this 10 mark question. If a candidate allocates 45 minutes to part (b) then the 10 mark part (a) should only occupy 10-12 minutes.

- (b) There was some variation in quality with marks ranging from 10 up to 25 for this essay. Some of the weaker answers were sometimes the result of spending too much time on part (a), and were rushed. The weaker answers only gave a superficial appraisal of the management of air pollution and used a vague use of examples. Better answers made detailed use of local case studies to give more consideration to the causes of urban air pollution and how the problem was/is being managed. Urban air pollution formed the topic of discussion for all candidates who answered this question and there were some excellent references to New Delhi, Mexico City and London.

Question 2

This formed a moderately popular question and responses to parts (a) and (b) had some equivalence in quality.

- (a) The soil profile in Fig. 4.1 was of a Brown Earth showing some distinct stratification thereby offering candidates the opportunity to describe the interaction of biotic and abiotic processes. Although the terms biotic and abiotic were not always used, all candidates expressed a detailed understanding of these soil components. Only the very good candidates expanded upon the development of a soil profile with its layering. This involved the accumulation of organic material and humification near the surface, subsoil percolation of water and leaching of sesquioxides and the deposition of the oxides in the lower layers of the profile. Weaker answers often obtaining 4 or 5 marks were either unclear about these processes or omitted them from their answers.
- (b) There were few difficulties in describing the causes of soil erosion and how soils may be used in a more sustainable way. There were frequent references to the effects of deforestation, over-farming and building construction in facilitating active soil erosion. These points were then followed by descriptions of a wide range of sustainable methods such as contour ploughing, terracing, organic fertilisation, afforestation etc.

Although there were some excellent discursive accounts that utilised local case studies, a significant number of candidates listed their points and did not provide illustrative examples. For most candidates this question proved a useful source of credit; occasionally bolstering a weaker part (a).

Question 5

This question was answered by approximately a third of the candidates. Although most had been well trained in the answering of questions on renewable and non-renewable resources there was quite a variation in quality.

- (a) High quality answers were clear about the differences between renewable and non-renewable resources and incorporated examples of each into their descriptions. There were some excellent references to renewable resources being a natural and replaceable flow, and used solar energy, water and wind as illustrations. Likewise these candidates were clear about non-renewable resources such as fossil fuels being finite within a long time scale.

There were however some weak answers that did not provide a clear distinction and sometimes confused recyclable resources with renewable resources.

- (b) This question was based on the use of sustainable sources of energy by LEDC's and MEDC's. Answers were generally quite sound with clear statements about the priorities of each group of nations. There was frequent reference to the necessary use of fossil fuels in LEDC's whilst MEDC's have both the financial reserves and technology to develop alternative sources of energy. Only a small number of candidates stated that many MEDC's do in fact have similar priorities to LEDC's in the continued use of fossil fuels particularly oil, whilst many LEDC'S are in fact actively developing alternative cleaner sources of energy. Although this question did not require the use of exemplars most candidates selected a good range of countries to illustrate their answer.

Conclusion

Overall this can be regarded a successful start to examining the new Environmental Management syllabus. There were probably bound to be some minor adjustment problems and these were manifest in the questions in many **Section A** answers and the disproportionate amount of time spent on the part (a) questions in **Section B**. It is important that candidates understand the physical processes that underpin many environmental issues and hazards. Good management relies on this clear understanding. Such questions will occur in **Section A** in the form of data response questions, simple definitions and descriptions. In **Section B**, many candidates need to better plan their timing and use the mark allocation as an indicator of the time that should be spent on each question.

Paper 8291/02

Paper 2

General comments

The content of Paper 2 derives from the Hydrosphere and Biosphere modules of the syllabus. In the old Environmental Science paper candidates often approached questions on these topics with greater confidence than questions based on the Lithosphere and Atmosphere; the new paper is no different. Paper 2 questions were invariably fully answered and the general quality of responses in **Section A** was far better than in Paper 1. The same is not so true of **Section B** answers where there was a similar spread of marks to those of Paper 1. Thus in general Paper 2 saw slightly higher marks than Paper 1.

Once again candidates are to be complimented on their use of local examples within their answers. It is a feature of this examination that candidates are given the opportunity to use case studies or local exemplar material.

Comments on specific questions

Section A

Question 1

This question derived from Key **Questions 1, 3 and 4** in the Hydrosphere section of the syllabus; part (a) being concerned with the global water cycle and part (b) water storage and its use and misuse. Candidates generally performed well with marks ranging from 7 through to 18 out of the 20 available.

- (a) Here the concerns were with the Global water cycle and its stores and transfers.
- (i) Most candidates correctly identified evapotranspiration or transpiration and precipitation whilst groundwater was sometimes confused with water table or simply underground rivers.
 - (ii) There were very few description of the ways in which water is lost from the land. Whilst some wrote lists and some others got as far as describing evaporation, there was a small number of very full descriptions including evaporation, transpiration and runoff.
 - (iii) Again very few candidates achieved the full marks for this question. Most described the processes of condensation and precipitation but failed to refer to air mass transfers from ocean/sea to land.
 - (iv) Although a small number of candidates did not do this question, the majority opted for long term increases in volume and wrote detailed descriptions of the impact of Global Warming in raising temperatures and melting snow and ice.

- (b) A significant number of candidates found part (b) more difficult than (a). The three questions in part (b) involved the natural storage of water and its use and misuse.
- (i) A surprising number failed to identify Fig. 1.2 as either a Syncline (technically correct) or a water table and lake were relatively infrequent errors.
- (ii) For this question candidates were invited to comment on why urban and rural areas would find such structures a useful source of water. Thus references to a replenishable store, natural filtering thereby cleaning or purifying the water, easily accessible water, well construction, a useful source in arid regions or being economically viable are all valid inclusions. It was not enough to simply state that aquifers usefully supply rural and urban areas.
- (iii) This question also proved to be an effective discriminator between weak and strong candidates. There were some very good references to industrial and agricultural waste seeping into the underground stores in a solute form. Weaker answers made simple statements about surface waste getting into the underground water stores without stating how.

Question 2

Part (a) of this biosphere question contained questions similar in content and format to those found within the former 8290 paper whilst part (b) looked at the impact of farming upon an ecosystem. Some candidates found part (b) difficult and as a consequence there was a wide variation in quality, with marks ranging from 3 to 18.

- (a) This part focused upon the functioning of food webs with questions ranging from basic definitions through to energy transfer within a small ecosystem.
- (i) Surprisingly a significant number of candidates confused the term food web with a simple food chain and ignored the interactions to be seen in Fig. 2.1.
- (ii) Most candidates achieved 2 marks for a correct identification of a primary producer and a primary consumer. Unfortunately it seems that many candidates did not understand the term detritivore and selected their answer from anywhere on the chart; and in a few instances from elsewhere e.g. a lion.
- (iii) This was generally well answered with accurate references to the knock-on effects of an increase in the population of woodmice and shrews.
- (iv) Although a question with which candidates should have some familiarity this question was quite poorly answered. Only 50% of the answers related a reduction in biomass to a 90% loss of energy at each trophic level.
- (b) This question involved the impact of bush following upon an area of virgin forest and factors linked to its subsequent recovery.
- (i) The majority of candidates achieved 1 mark for this question. Although candidates were fairly clear about the loss of primary forest they did not express this in terms of a loss of habitat to a variety of species including fauna.
- (ii) Even though Fig. 2.3 was clearly labelled, many candidates failed to recognise this question as being concerned with a plant succession and simply stated that the land had been rendered useless through over-farming. Only a small number of answers described the succession of processes that would take the area to a Secondary Forest cover.
- (iii) Two ecological differences were needed for this answer and most candidates mentioned a greater biomass in stage 1. Unfortunately it is not then valid to state as a second difference, less biomass in stage 4; they are the same single point. Further reference to habitats or the type of vegetation would have been valid as the second difference.
- (iv) The impact of an increase in population in an area that has experienced bush following is to allow less time for the vegetation to recover. Ultimately this would lead to desertification. Many candidates took an alternative route by describing the effects of increased urbanisation and extending the area farmed. Whilst worthy of some credit this could not on its own achieve full marks.

Section B

Questions 3, 4 and 5 attracted about the same numbers. In contrast to Paper 1 the **Section B** were of different quality to Paper 1 in that the first part to each question elicited better responses while the 30 mark essays were not of the same quality.

Question 3

This question focused upon the impact of human activity upon an environment, with a data description part **(a)** on the Aral Sea followed by an analysis of the restoration of an ecosystem in a named environment of the candidates' choice.

- (a)** In general this question was well answered. There was quite a lot of information for the candidates to analyse and the best answers managed to review the diminished size of the Aral Sea in terms of water extraction in an arid region. These answers contained good descriptions of the use of canals to irrigate large areas along with the needs of urban areas such as Tashkent, Nukus and Ashkhabad.

Weaker answers tended to be relevant but contained less detail on the water extraction strategies and often omitted supportive information on climate.

- (b)** There was quite a variation in the quality of responses to this question. This was largely dependent upon the environment chosen by the candidate, and the nature and scale of the conservation strategies that have been employed in the region. Candidates did well by choosing either a designated conservation area such as a National Park or according to the region chosen e.g. a local area or place; answers based on local knowledge were often better than those on remote places. Invariably this group of answers contained a number of relevant strategies and most important were evaluative.

Weaker answers were often a product of a candidate trying to recollect an environment whose ecosystems are under threat and rather superficially mustering together sufficient information on conservation and restoration. Some of these answers either did not name a particular environment or whilst the name was provided, the analysis was sufficiently vague to have relevance to almost any area. Additionally weak answers did not contain much in the way of evaluation.

Question 4

Water management within a drainage basin formed the central theme for this question. Part **(a)** aimed at focusing the candidate upon water quality and supply through a picture containing a number of different types of human activity within a drainage basin. Part **(b)** took the theme a stage further with a description and evaluation of strategies targeting the management of flooding and pollution. Of the three questions in **Section B** this proved to be the more demanding.

- (a)** Responses to the information provided in Fig. 4.1 proved to be rather disappointing. Only a couple of candidates concerned themselves with the water supply and water quality features shown in Fig. 4.1. Under water supply these answers described the purpose of the dam and reservoir and included a lot of information on water extraction for agricultural and industrial use in the region below the dam. These answers were equally clear about the issues related to industrial and agricultural pollution in the area depicted.

The majority were however rather vague. It seems that having identified some of the features shown in Fig. 4.1, many candidates then wrote about drainage basins in general and made no reference to the depicted area. Not only did this encourage some very vague answers but also for some, irrelevance e.g. pollution from urban regions that are not included in the diagram. These answers were also poorly balanced with the focus being water quality rather than quality and supply.

- (b) Again although there were a small number of good quality responses to this question the standard was a little disappointing. Good answers used either one or two named rivers and there was a high level of description and evaluation. These answers took up the theme of the management of both flooding and pollution, and related specific issues, strategies to places in the chosen river basins.

An incorrect approach to this question was to describe the various factors associated with flood and pollution management and then almost as a concluding statement state that these strategies "can be found in the following river basins". Other weak answers almost listed as many rivers as could be thought of in the time available and ascribe to them a very brief statement about a flood and/or pollution issue.

Question 5

This question was quite well answered with candidates making good attempts at both parts.

- (a) It seems that giving candidates a structure in which they had to outline their reasons for agreeing or disagreeing with the predictions of the Limits to Growth report was to the candidates liking. Most answers divided into two sections with reasons for and against equally well outlined and then focused upon the impact of population growth upon industrial development and the increased consumption of resources. These points took many candidates into a discussion of either the pessimistic scenario of Malthus or the optimistic view of Boserup. These avenues enabled agreement or disagreement with the predictions. Very few candidates referred to the changing levels of pollution shown in the graph.
- (b) There were some very good answers to this question. Candidates expressed a good understanding of sustainable development and were able to apply it to agricultural land use. Most answers contained details on organic fertilisers, cropping techniques, contour cultivation, crop rotation and a small number extended their answer to include genetic engineering and in reference to SE Asia the Green Revolution.

Better marks were obtained by candidates who adopted a discursive approach and attempted an evaluation of the degrees of success or failure of strategies. Some candidates listed their strategies with a limited amount of discussion. This approach often led to a lack of evaluation and consequently weakened the answer.

Conclusion

To reiterate the point made about Paper 1 the responses made by candidates to this new examination are encouraging. Fears that candidates would find the writing of essays difficult were thwarted by the quality of written expression shown by the majority of candidates. Significantly the quality of answers to short answer data response questions has followed the pattern of the Environmental Science paper in that answers on the Hydrosphere and Biosphere were of a high standard.

Once again candidates used their time well. Paper 2 saw no rubric errors and there were very few incomplete scripts. It is valid to state that essay practice and examination paper timing must form an important feature of preparing candidates for the examination.

Paper 8291/03

School Based Assessment

General comments

May/June 2005 has seen the first examination of this new syllabus titled Environmental Management. Although this session only attracted 48 candidates, this did form a slight increase over the numbers previously entered for Environmental Science. Like the written examination papers the Individual Research Report has seen some changes; mainly to its content emphasis and length. Needless to say, like all new examinations that have replaced a former syllabus, there will be a period of transition as Centres become familiar with slightly different expectations.

The general standard of the research reports was quite high and the majority of Centres adhered to the assessment criteria; notably that of length. As with the previous examination and reflecting the nature of entry to the examination there were a wide variety of topics. These ranged from localised studies of water pollution, urban environments and agricultural land-use impacts through to issues of a more general nature. Significantly where a localised issue was taken up, the report proved to be more succinct and elicited higher marks.

Centres are to be congratulated on their internal assessment of reports. Careful use was made of the new assessment criteria and any adjustments following external moderation resulted in a commonality of standards. This is easily achieved when Centres generally assess their candidate's work accurately and consistently.

Comments on specific assessment criteria

Skill C1: Research and planning

According to the chosen topic, standards for this skill were quite varied. It is important that from the beginning candidates establish a clear hypothesis or question. This should be a little more than a title for the report and ideally should not take the form of a multiple questions and hypotheses. For example a title might well be 'The impact of an urban area upon a local climate' and the hypothesis 'an urban area creates a heat island in which temperatures progressively decrease with distance from the named town or city'. It is not necessary to subdivide this topic into further hypotheses and such a statement lends itself to a precise explanation in Skill C1 (b).

Once the question or hypothesis is established the remainder of Skill C1 should follow on. It is important that candidates plan their research. This should not be over complicated and relate directly to the topic and Skills C2 and C3 that require the collection of data and its presentation. Topics involving field study must use appropriate equipment and not ignore the need for accurate recording and the allocation time to do the work. Likewise if the research involves laboratory investigation or indeed a combination of methods careful consideration should be given to how the data should be obtained, recorded and ultimately presented. The explanation and justification of the methods need not be lengthy and should enable the candidate to gain confidence in their work.

This examination session saw about half the entry fulfilling most of the requirements of this skill. Some candidates wrote over lengthy preambles that occupied over half the report. As stated above a short explanation of the hypothesis is important but it should not be at the expense of an explanation of the results of the research.

Skill C2: Data collection and presentation

This skill showed a similar variety in standard to Skill C1. Obviously, if the methodology is clear and accurately carried out candidates should be in possession of a valid and usable set of data. The weakest part of Skill C2 lay in sections (a), (b) and (e). Whilst a minority included a wealth of data in the form of statistics as appendices, many submitted reports in which too little data was absorbed into the text of their report. The better reports contained a section in which statistics were presented in the form of tables, graphs etc. as part of a general presentation and explanation of their findings; it is important to remember that illustrative material can be in the form of photographs or news cuttings. Candidates and their teachers should be aware of the difference between Skills (a) and (b); (a) requires presentation in a suitable format and (b) requires accuracy in data collection.

The quality of Skills (c) and (d) was quite impressive. Centres had obviously correctly advised their candidates on the need for a logical presentation of material and from the vast majority of candidates there were few problems with the quality of written presentation. Although Internet sources were often used it was also significant and important that plagiarism and direct copying was not a feature of this years' reports.

Finally it is important to realise that a suitable statistical tool does not necessarily mean a sophisticated statistical method. Although such tools as chi-squared and rank correlation can be used if the data requires such verification it is also possible to achieve the same end with a graphical technique. Many statistical tools can be used to verify the validity of the data and can be used within the concluding section of the report.

Skill C3: Conclusions and evaluation

This forms a vital aspect of any research report, enabling a rounding up of the work accompanied by a critical assessment of the work. Most candidates were able to produce valid conclusions to their work. For a small number of candidates, the most serious omission being a reference to their data. Some candidates sought to use the conclusion as an avenue to explaining their results rather than drawing such data and explanations together in the form of a final summary of the findings of their research.

An impressive feature of the reports this session was the quality of Skill (b). There were some excellent appraisals of environmental and management principles and these were used to explain trends and patterns in the candidate's results.

As with any form of scientific research, where a hypothesis or question is clearly established at the start, a conclusion should express the degree to which findings of the work agree or disagree with the initial expectation; both routes are valid.

The final aspect of Skill C3 involves an evaluation of the whole project. This can include the research as well as the presentation and explanation of its findings. Candidates invariably find it easy to fault their work but more difficult to praise it; limitations and areas of success should be briefly outlined and justified as such.

Concluding remarks

For most Centres it is a matter of developing that which has been achieved this year. There is a need for some Centres to pay closer attention to the assessment criteria and to make certain their candidates are fully aware of how their work will be assessed. This syllabus does permit teachers to guide their candidates through the project without doing it for them.

As we move away from the Environmental Science mindset it is to be hoped that issues which have an environmental management emphasis will come to the fore and that topics will be chosen from all syllabus modules; i.e. lithosphere, atmosphere, hydrosphere and biosphere.