CARIBBEAN EXAMINATIONS COUNCIL

REPORT ON CANDIDATES' WORK IN THE ADVANCED PROFICIENCY EXAMINATION

MAY/JUNE 2011

ENVIRONMENTAL SCIENCE

UNIT 1

GENERAL COMMENTS

In Unit 1, overall performance was comparable with that of 2010 with 92 per cent of candidates achieving Grades I–V. However, there was a decline in the standard of the school-based assessment due to the fact that the new guidelines for the School-Based Assessment are not being interpreted and applied correctly in accordance with the new syllabus. In terms of module performance, candidates did best on Module 3 (Sustainable Use of Natural Resources), followed b Module 1(Fundamental Ecological Principles) and then Module 2 (Human Population and the Environment).

DETAILED COMMENTS

Paper 01 – Multiple Choice

Paper 01 consisted of 45 multiple-choice items with 15 items from each module. Candidates' performance on this paper was very good.

Paper 02 – Essay Questions

Overall, candidates' performance was best in Module 3 followed by Module 1 and then Module 2.

Module 1: Fundamental Ecological Principles

Question 1

In Part (a), candidates were required to use a graph illustrating how the numbers of two species in a symbiotic relationship changed over time; identify the type of symbiotic relationship illustrated; explain how the symbiotic relationship may have resulted in the illustrated graph; analyse a statement based on the graph and make deductions from the graph about the number of individuals in particular species.

Most candidates were able to correctly identify the type of symbiotic relationship that was depicted but there were too many candidates who could not explain how the symbiotic relationship may have resulted in the graph.

Part (a) (iii) required candidates to interpret the statement *The presence of Species 2 is a limiting factor for Species 1* based on their analysis of the graph. Candidates had difficulty interpreting the statement. This was compounded by the fact that not too many candidates knew what limiting factors were and as a result, many candidates failed to correctly interpret the statement.

Part (b) tested candidates on the principle of energy transfer and energy flow in ecosystems. This part of the question was done very well by candidates.

Question 2

Part (a) required candidates to name and describe an appropriate method for determining and calculating species diversity of non-mobile organisms. Part (b) tested candidates' ability to deduce information on species diversity from a graph. Part (c) tested candidates' understanding of the concept of ecosystem stability.

For Part (a), in most cases, candidates were unable to give an accurate description of the method named.

In Part (b), candidates were unable to read and interpret the data from the graph and this led to them not being able to make the correct calculations.

For Part (c), while most candidates were able to define the term *ecosystem stability*, they were unable to explain why a low species diversity may have resulted in poor ecosystem stability.

Candidates' performance on this question was poor.

Module 2: Human Population and the Environment

Question 3

Parts (a) and (b) of this question were based on age structure diagrams for three countries. In Part (a), candidates were required to name three types of population pyramids that are constructed based on mortality and fertility rates. Most candidates were able to name at least one type of population pyramid.

Part (b) required candidates to make deductions about population growth for each of the three countries represented by the pyramids and to distinguish whether the pyramids represented developing or developed countries, giving reasons for their answers.

In Part (b) (i), many candidates were unable to make correct deductions from the graph. In many instances, candidates did not pay attention to the diagrams and simply discussed trends without linking them to the diagrams and without discussing population growth.

For Part (b) (ii), candidates were able to correctly distinguish population pyramids for developing and developed countries. However, candidates were unable to give appropriate

reasons for their responses. This demonstrated that candidates did not fully understand population pyramids and how to interpret them.

Part (c) was done very well. Most candidates were able to discuss how age of marriage, family planning services and government policy affected human population growth rate. The more able candidates recognized both positive and negative impacts of these factors and were able to present a balanced discussion.

Question 4

Part (a) of this question presented a graph showing the percentage of people living in rural and urban areas in three countries. Candidates were required to complete the diagram by inserting the missing bars for two of the countries; this required them to calculate the percentage of people living in the urban areas for Country B and the percentage of people living in the rural areas for Country C. Candidates experienced some difficulty with this part. Many candidates did not correctly calculate these values because they did not know that the sum of the percentage of people living in rural and urban areas in each country totalled 100 and many candidates failed to complete the diagram correctly.

In Part (a) (ii), candidates were required to compare the distribution of rural and urban population in the three countries. This was challenging for some candidates who were unable to interpret information from the graph.

For Part (a) (iii), candidates were required to explain why the population growth in Country B may have resulted in the distribution illustrated in the graph and this was also challenging for those candidates who were unable to interpret graphs.

In Part (b), candidates were required to describe two environmental impacts associated with the type of population distribution in Country C. Most candidates were able to correctly outline two environmental impacts.

Part (c) tested candidates' understanding of the concept of sustainable development. Most candidates demonstrated a very good understanding of this concept and were able to explain how an increase in the population may affect a country's ability to achieve sustainable development.

Module 3: Sustainable Use of Natural Resources

Question 5

Part (a) required candidates to identify two natural resources for a named Caribbean country and Part (b) required them to give reasons why one of the natural resources identified was important to the named Caribbean country. These parts were done very well.

Part (c) required candidates to study a graph and interpret the information presented. Once again as was demonstrated throughout, most candidates had difficulty with interpreting and reading information from the graph. In addition, many candidates failed to explain how the new environmental policy would have affected the illegal tree harvesting trade. This was primarily the case because many candidates attempted to answer the question without reference to the graph. This also resulted in candidates failing to determine how long it took for illegal tree harvesting to return to the level that existed before the new road was built.
Overall, candidates demonstrated limited skills at interpreting graphs and making deductions from graphs. As a result many candidates performed poorly on this part of the question. Overall, candidates' performance on this question was, however, satisfactory.

Question 6

For Part (a), most candidates were able to give a reason why natural resources should be conserved.

In Part (b), a few candidates understood the concept of waste reduction and minimization and were able to explain how the practice could result in natural resource conservation.

Part (c) required candidates to relate waste minimization and waste reduction to industries and discuss measures that could be used to encourage industries to practise waste reduction and waste minimization, while discussing the effectiveness of such measures in the Caribbean. A few candidates were able to adequately explain how industries in the Caribbean can be encouraged to implement waste minimization and waste reduction and to discuss the effectiveness of the use of such measures in the Caribbean.

Part (d) required candidates to analyse the information presented in a diagram on water quality in quarry effluent before and after settling pond treatment and to make deductions from the data presented.

Overall, candidates demonstrated limited skills at interpreting graphs and making deductions from graphs and as a result many of them performed poorly on this part of the question.

Paper 031 – School-Based Assessment

In previous years, the School-Based Assessment (SBA) was a project to be presented in the form of a report with the following parts:

(i) Title page, name, date, table of contents
(ii) A statement of the task — purpose of the project
(iii) Methods of data collection and literature review
(iv) Presentation and analysis of data
(v) Discussion of findings and limitations

(vi) Conclusions
(vii) Bibliography

The SBA for the revised syllabus assessed for the first time this year consisted of a journal. Reports for a series of site visits and laboratory exercises associated with the site visits were to be recorded in the journal.

The journal comprised:

(i) An entry for each site visit
(ii) Laboratory exercises
(iii) A final report of the set of site visits

Site visits are assessed as shown below:

(i)	Entry Number	
(ii)	Date	
(iii)	Site (location)	
(iv)	Objective(s)	1 mark
(v)	Activities	4 marks
(vi)	Observations	2 marks
(vii)	Comments	2 marks
(viii)	Follow-up Activities	1 mark
		10 marks

Laboratory exercises are assessed as shown below:

(i)	Planning and Designing	4 marks
(ii)	Observation and Recording	5 marks
(iii)	Manipulation and Measurement	2 marks
(iv)	Analysis and Interpretation	6 marks
(v)	Reporting and Presentation	3 marks
		20 marks
		(scaled to 10 marks)

The final report is assessed as shown below:

(i)	Clarity of the statement of the world problem (project description)	2 marks
(ii)	Definition of the scope of the project (purpose of the project)	3 marks
(iii)	Adequacy of information/data gathered and the appropriateness of the design chosen for investigating the problem	3 marks
(iv)	Appropriateness of the literature review	5 marks
(v)	Presentation of data/Analysis of data (summary of	

	the site-visits and laboratory exercises)	6 marks
(vi)	Discussion of findings	8 marks
(vii)	Conclusion	3 marks
(viii)	Recommendations	4 marks
(ix)	Communication of information	4 marks
(x)	Bibliography	2 marks
	Total	**40 marks**

Candidates' performance on the school-based assessment was satisfactory. Teachers must be reminded that journal entries are to be based on either field visits to one site where changes over time are observed or visits to different sites to compare and contrast similar processes or occurrences. This was done by most students. However, there are still some students with insufficient site visits.

In general, most students submitted an adequate number of laboratory exercises which were mostly well done. In a few instances, the spread of the laboratory exercises was too narrow and the laboratory exercises chosen were too simple for the level of examination.

While most students' work demonstrated adequate coverage of the skills to be assessed, there is still room for improvement in the areas of manipulation and planning and designing.

The quality of the journals submitted was satisfactory. However, there were some students who were unable to link journal entries and laboratory exercises to specific objectives and conduct appropriate, complementary and supporting activities. Teachers and students should be reminded that the laboratory activities should be associated with the site visits and not treated as independent activities that are not related.

Paper 032 – Alternative to School-Based Assessment

Question 1

In Part (a), candidates were expected to use the information provided to draw a bar graph showing the variation in the number of species at two sites.

For Part (b), candidates were asked to calculate species abundance and species diversity. Candidates were required to use the values that were calculated for these two parameters to decide which of the two sites was expected to be more stable. Candidates were also required to justify their answer.

In Part (c), candidates were required to describe a method which may be used to estimate the population size of moving organisms. They were also required to state three assumptions of the method chosen.

Candidates' performance on this question was good. Many of them had difficulty plotting the graph to represent the data.

Some candidates also had difficulty calculating the species diversity and species abundance. It was apparent that some candidates did not know the formula to be used to calculate species diversity. A few candidates also did not understand the concept of species abundance.

Candidates should be aware that when asked to plot a graph marks are generally awarded as follows:

- giving the graph an appropriate title
- correctly labelling the horizontal and vertical axes
- correctly labelling the graphs
- using an appropriate scale on each axis
- plotting all points correctly
- drawing a smooth curve through all points

Question 2

This question was designed to test candidates' understanding and knowledge of how to calculate population parameters and how these parameters interacted to influence population change.

Part (a) required candidates to calculate the following based on information provided in a table: population size, birth rate, rate of natural increase, total population increase. Most candidates were unable to calculate these population parameters.

Part (b) required candidates to make deductions about birth rate and life expectancy from diagrams showing stages of demographic transition. This part of the question proved to be problematic for some candidates.

Part (c) required candidates to explain how fertility rates affected the population growth of developed and developing countries. This part of the question proved to be problematic for most candidates. It was obvious from the responses that candidates did not understand how fertility rates affected population growth in developed and developing countries.

Part (d) required candidates to list ways in which human populations impact negatively on the environment and also explain how lifestyles in developed and developing countries impacted on the patterns of consumption of natural resources. Most candidates were able to answer this part of the question very well.

Question 3

Part (a) of this question required candidates to use information provided to plot a line graph. Candidates were then required to use the graph to determine the rate of construction of houses in the Aripo Savannah from 1975-2000 and to estimate the number of houses in the Aripo Savannah in 2010. Most candidates performed very well on this part of the question.

Part (b) required candidates to state two reasons for the importance of the Aripo Savannah as a natural resource. Part (c) required candidates to describe three measures that the Government of Trinidad and Tobago could use for the management and conservation of the savannah while Part (d) required candidates to choose one of the measures and discuss its likely effectiveness.

Most candidates were able to provide correct answers to Part (b) but Part (c) and Part (d) proved problematic to some candidates. Candidates were unable to provide discussions and descriptions with the scope and depth required at the CAPE level.

UNIT 2

GENERAL COMMENTS

In Unit 2, 93 per cent of the candidates achieved Grades I–V compared with 97 per cent in the 2010. Similar to Unit 1, there was a decline in the standard of the school-based assessment. The new guidelines for the Internal Assessment are being interpreted and applied correctly in accordance with the new syllabus.

Candidates performed best on Module 1 (Agriculture and the Environment), followed by Module 2 (Energy and the Environment) and then Module 3 (Pollution and the Environment).

DETAILED COMMENTS

Paper 01 – Multiple Choice

Paper 01 consisted of 45 multiple-choice items with 15 items from each module. Candidates' performance on this paper was good.

Paper 02 – Essay Questions

Module 1: Agriculture and the Environment

Question 1

Part (a) was done well by most candidates. Most candidates were able to list three characteristics of commercial agricultural systems.

Part (b) was also well done by candidates and they were able to give examples of the use of technology in agriculture and also to discuss how technology could be used to improve agricultural productivity.

Part (c) required candidates to study a graph which compared the yield obtained by a farmer when using inorganic and organic fertilizers. Most candidates were able to make appropriate deductions from the graph about the agricultural yield and also gave valid reasons why organic fertilizer was promoted as a feasible option to the use of inorganic fertilizer.

In their responses, candidates demonstrated an awareness of the issues concerning the use of organic versus inorganic fertilizers. Overall performance on this question was very good.

Question 2

Part (a) tested candidates' ability to read and interpret a graph depicting contributions made by subsistence and commercial agricultural to agroprocessing, food security, Gross Domestic Product (GDP) and employment in a Caribbean country. Part (b) tested candidates understanding of sustainable agriculture; Part (c) tested candidates' understanding of climate change and its impact on sustainable agriculture; and Part (d) tested candidates' understanding of agroforestry as an environmentally sustainable practice.

Part (a) was done fairly overall. Most candidates were able to identify and explain trends in the graph.

.

Part (b) was generally done well by most candidates. Part (c) was challenging for some candidates. Even though many candidates had an idea of the impacts of climate change, they were unable to clearly explain how climate change could be a major threat to sustainable agriculture in the Caribbean.

Part (d) was generally well done by most candidates who demonstrated an understanding of the concept of agroforestry and why it is considered an environmentally sustainable practice in agricultural systems.

Module 2: Energy and the Environment

Question 3

Part (a) tested candidates understanding of trends in the use of commercial energy resources. Candidates were required to describe the pattern of commercial energy resource use after studying a graph. This part of the question also tested candidates' ability to interpret a graph and identify and explain trends. Part (a) was generally fairly done by the candidates. The more able candidates were familiar with the skill of interpreting graphical data.

Part (b) was poorly done. Candidates were required to make deductions and inferences from a graph and many of them were not able to correctly answer this question, they did not correctly interpret the information presented.

Most candidates performed better on Part (c) and Part (d) since they were able to identify limiting factors for the use of energy resources and to discuss the relevance of the alternative energy sources.

Question 4

Parts (a) (i) and (ii) required candidates to use an annotated flow diagram to illustrate the conventional generation of electricity using natural gas as the fuel. Parts (a) (i) and (ii) were, in general, poorly done. Candidates were unable to draw and annotate a diagram that showed the conventional generation of electricity using natural gas as a fuel.

It was clear that many candidates could not represent the process of conventional electricity generation using a flow chart because they simply did not understand the process.

Part (b) required candidates to study the information presented in a table on generation and consumption of electricity in various Caribbean countries. Candidates were required to classify countries using given criteria and to present their answers in a suitable table. Some candidates appeared not to follow instructions and did not use the established criteria.

Part (c) required candidates to study a graph which depicted energy generation and consumption for three Caribbean countries and to calculate the difference in electricity generation between Grenada and St Kitts and Nevis. This part of the question required candidates to apply their graph interpretation skills and this posed a problem for some candidates.

Part (d) required candidates to outline one impact of the use of fossil fuel on the environment. This part of the question was done well by many candidates. Most candidates were able to outline impacts such as *global warming, habitat destruction* and *pollution* as they related to fossil fuel use.

Module 3: Pollution of the Environment

Question 5

Part (a) tested candidates understanding of secondary air pollutants. Most candidates performed well on this part of the question.

Part (b) required candidates to use an insert and complete the pathway of a pesticide when sprayed aerially to show how it may enter humans and the ocean. This part of the question was done well by most candidates.

Part (c) was generally well done. Most candidates were able to identify the processes that were labelled.

Part (d) was generally poorly done by most candidates. In Part (d) (i), too many candidates were unable to state inferences that may have been drawn from the results that were presented in a table which showed the concentration of pesticide in organisms from an aquatic ecosystem. In Part (d) (ii), many candidates had difficulty calculating the minimum concentration factor of the pesticide in the tertiary consumers and so had difficulty in Part (d) (iii) which required them to explain the pattern of pesticide concentration in the ecosystem shown in the table.

Question 6

Part (a) tested candidates' graph interpreting and analytical skills using a graph which presented information on the amount of waste produced by three countries for the period 1965–2005. Candidates performed well on Part (a) (i) and (ii) which required them to list three categories of waste produced in the Caribbean and to make three deductions from the information presented in the graph. Part (a) (iii) was challenging for some candidates as they had difficulty using the information presented to estimate the projected waste production in 2010 for County A.

Performance on Part (b) was satisfactory. Most candidates were able to present answers that assessed the effectiveness of legislation, policy incentives and public awareness and education as mitigation measures or solutions for environmental pollution.

Paper 031 – School-Based Assessment

With the revised syllabus, the format of the School-Based Assessment (SBA) for Unit 2 remained largely unchanged except for minor adjustments. The format for the SBA is described on pages 52–56 in the syllabus.

Students' performance on the SBA for Unit 2 was not satisfactory. Some students conducted the requisite number of site visits. However, there are still too many students with insufficient site visits. Teachers and students must be reminded that formal entries are to be based on either field visits to one site where changes over time are observed or visits to different sites to compare and contrast similar processes or occurrences.

Some students submitted laboratory exercises, however the number of students who did not submit the requisite number of laboratory exercises is too high. For those students who submitted laboratory exercises, in some cases, the laboratory exercises were not in any way related to the site visits. Teachers and students need to spend more time developing the following laboratory skills:

- Manipulation and Measurement
- Analysis and Interpretation
- Planning and Designing

The quality of the journals submitted was not satisfactory. Students were unable to link journal entries and laboratory exercises to specific objectives and conduct appropriate complementary and supporting activities.

Teachers and students should be reminded that the laboratory exercises should be associated with the site visits and not treated as independent activities that are not related.

Paper 032 – Alternative to School-Based Assessment

Question 1

This question tested candidates' ability to present data in a graphical form, and to identify and describe trends from this data. Part (a) required candidates to present the data that were presented in Table 1 on the effect of two different fertilizers on crop production in a line graph. Candidates were also required to study the information and recommend the best application rate for the new fertilizer. Candidates were also required in Part (iv) to calculate the difference in crop yields at an application rate of 65kg/ha.

Candidates' performance in this part of the question was satisfactory. Many candidates had difficulty plotting an appropriate line graph to represent the data. Candidates should be aware that marks are generally awarded as follows for the plotting of graphs:

- giving the graph an appropriate title
- correctly labelling the horizontal and vertical axes
- correctly labelling the graphs
- using an appropriate scale on each axis
- plotting all points correctly

- drawing a smooth curve through all points

Some candidates had difficulty calculating the difference in crop yields at an application rate of 65kg/ha. This indicated that they did not know how to read information from graphs.

In Part (b), candidates were required to study some diagrams which illustrated a number of different sustainable farming practices. Candidates were required to name the farming practices; explain how Farming Practice A could allow for maintaining ecological integrity of the farm and also how Farming Practice A differs from Farming Practice B. While most candidates were able to correctly identify and name the different farming practices and distinguish between the two farming practices, some candidates had difficulty explaining how the farming practices could help maintain ecological integrity.

In Part (c) candidates were required to explain why farmers in the Caribbean should be concerned about global warming. This part of the question was done well by candidates.

Question 2

This question tested candidates' ability to interpret data presented in graphical form, and to identify and describe trends from the data. The graphs presented illustrated the amount of carbon dioxide emissions produced by a number of Caribbean countries.

The performance on this question was poor. Candidates were unable to extract information from the graphs, discuss trends and make calculations based on the graph. The majority of the marks gained by candidates in this question were for Part (b) which required candidates to define energy efficiency and identify methods of improving energy efficiency while explaining how the method identified would result in improved energy efficiency.

Question 3

In Part (a), candidates were presented with a table containing information or some characteristics of three pesticides; they were required to state what is meant by 'half-life' and to explain which one of the three pesticides would most likely continue to pollute ground water supplies a year after application. Most candidates did well on these parts of the question. In addition, candidates were required to construct a bar graph to present the information in the table. Candidates' performance on this part was satisfactory.

In Part (b), candidates were expected to consider the properties of pesticides and explain one other characteristic that a farmer should consider if he/she wanted to apply all three pesticides at the same time. Too few candidates understood that the synergistic effect was when two or more pollutants may interact to give a combined effect. The combined effects are sometimes more severe than the sum of their individual effects. Therefore, pollutants that are able to combine in this manner will cause greater environmental impact.

Part (c) presented candidates with a table showing the concentration of Pesticide C in the tissues of two different types of organisms. It required candidates to use the information to calculate the concentration factor for the pesticide in the tertiary customer. Candidates were also asked to explain why the pesticide concentration in the fish was so high even though no pesticide was applied for the last two years. Most candidates performed well on this part of the question.