**General Certificate of Education (A-level)
June 2012**

Environmental Studies   **ENVS4**

(Specification 2440)

Unit 4: Biological Resources and Sustainability

Report on the Examination

General

The majority of items on this examination paper were accessible to most students, eliciting a wide range of responses. Many students revealed themselves as well informed about the environment and well prepared to tackle the paper.

Strongly performing students are clearly characterized by their good subject knowledge, but they also take care to distinguish between command words in questions and to make the appropriate number of distinct points in their answers.

Question 1

As intended this proved a straightforward opening question for most students. For those who failed to gain full marks the most frequent error was to offer statement G instead of B as the definition of the term 'abiotic factor'. While temperature certainly is an abiotic factor, statement B provided the best general definition of the term: statement G would have been more appropriate for the term 'range of tolerance'. In questions such as this students must carefully consider all possibilities and at Advanced Level they must expect to be tested with some finely nuanced distinctions.

Question 2

(a)   The vast majority of students selected the correct values from the table and , clearly carried out the straightforward calculation required: unfortunately a significant number then lost marks through rounding errors. The published mark scheme makes clear acceptable and unacceptable answers and schools and colleges may wish to remind future students of how to apply their GCSE level mathematical knowledge in this context.

(b)(i)&(ii)   Rounding errors again led some students to lose marks. Others clearly misinterpreted the command word '*estimate*' and assumed they were to guess the answers. Students were again required to calculate their answers but these were necessarily estimates since they depended on the estimate of erosion rate for a wheat field provided in the question.

(c)   This was generally well answered.

(d)   There were some very sophisticated answers to this question, with students showing real understanding of the management of livestock to avoid poaching of soil, especially in congregation areas and in wet weather. As is so frequently the case, some students lost marks by writing at length about one or two aspects instead of dealing with four different points. Others lost out by writing answers which focused simply on the presence or absence of livestock, rather than on the management of livestock on the land.

Question 3

(a)   The description of the photograph clearly stated that it showed a crop which had been selectively bred, not one which had been created using GM techniques. Some students failed to take note of this and wrote answers which related to GM crops in particular, rather than to genetically uniform crops in general.

(b)   Answers to this question often revealed confusion between embryo transfer and artificial insemination and sometimes between embryo transfer and cloning.

(c)   When answering this question students frequently fell into one (or both) of two common pitfalls: some did not read the question carefully enough and wrote about *why* genetic engineering may be used, rather than *how*, while others included as one of their points the fact that GM crops cannot be produced using natural pollination - information given in the question.

(d)   (i)&(ii) Answers to these questions suggested that the requirement for knowledge of statistical methodology came as a bolt from the blue for some students. It may be helpful to draw attention to the following paragraphs from Section 3.6 of the Specification:

[Students should] have a general understanding of levels of significance in drawing conclusions from experimental data and of the need for statistical tests to establish these levels.

A-level students should also be familiar with the use of the following statistical tests, understand when they might be validly applied and be able to interpret results obtained. Students will not be expected to recall the formulae in written papers:
Mann-Whitney U Test
Spearman Rank Correlation
Chi squared test
t-Test

Question 4

(a) (i)&(ii)   These questions were frequently well answered. The most common reason for failing to earn two marks was writing about only one reason, rather than the two required for two marks.

(b)   (i)   Most students correctly appreciated that a transect was required. Relatively few seemed aware that to achieve a valid investigation of variations in microclimate it is necessary to take simultaneous readings at each sampling station. Assuming that anemometers or other wind-speed measuring devices are suitably calibrated it is not necessary (and would indeed be very difficult) for all readings to be taken by the same person. Students at Advanced Level should be aware that simply stating that repeat measurements will be necessary, or that they can be used to calculate a mean, is not sufficient to achieve a mark.

(b)   (ii)   Most students could use the flow diagram to correctly identify the most appropriate statistical test. It would not be unreasonable to expect students to use similar information to provide justifications for the use of a particular statistical test.

Question 5

(a) Most students found this an accessible question but many failed to develop four separate points in their answers. When writing about fossil fuel subsidies to agriculture, some students wrote about fuel for tractors, failing to appreciate that commercial organic farming is often every bit as mechanised as 'conventional' farming and that it is in agrochemical manufacture that the greatest energy subsidy lies. Some students described financial support for organic farming under Environmental Stewardship: while this may help to increase supply it does not have a direct effect on demand.

(b) **(i)/(ii)** These questions were generally well answered, with the chief cause of lost marks being the failure to include three distinct points in each answer. With regard to part **(b)(i)** it should be noted that, in the UK and USA at least, sewage sludge may not be used on land used for growing crops certified as organic.

Question 6

(a) Many students failed to recognise the significance of natural mortality as a result of a lack of space in the adult population.

(b) **(i)** Answers to this question frequently came in the form of rambling descriptions, rather than clearly stated points, supported by data drawn from the chart. Some students misinterpreted the chart as showing growth and decline in fish populations over time, rather than the age structure of the populations.

(b) **(ii)** Many students correctly identified breeding by surviving fish as a cause of increased future catches.

(b) **(iii)** Some students incorrectly equated safe minimum spawning population with Maximum Sustainable Yield, perhaps believing that this term must find a place somewhere in answer to questions about fishing. In fact, while MSY refers to fish which are removed from a population safe minimum spawning population relates to fish which remain.

(c) **(i)** Many students scored well on this question. 'By-catch rate' in the table referred to by-catch of other species when fishing for Orange Roughy or Atlantic Mackerel, but since this was somewhat ambiguous examiners allowed reference to high by-catch as a reason for overfishing of Orange Roughy.

(c) **(ii)** In this question there was no ambiguity about by-catch: the question clearly referred to the high by-catch rate of Orange Roughy fishing. Many students identified removal of their food species as a possible effect on the Orange Roughy but fewer suggested that predators or competitors might also be removed, to the benefit of Orange Roughy.

(d) It seemed a shame that, while many students identified either safe breeding within the exclusion zones or migration from them, relatively few incorporated both ideas to achieve two marks.

Question 7   (essay question)

There were some excellent essays – full of accurate scientific content, providing a balanced response to all parts of the question and with effective use of scientific prose. Others fell far short on one or more of these criteria. When preparing students for the essay question schools and colleges should emphasise the need for quality rather than quantity: ample space is provided on the printed examination paper.

(a)   This title elicited some very good answers. Some students failed to address the issue of changes in the use of vehicles in sufficient detail and a few wrote extensively about goods transport. Many students had clearly heard of regenerative braking but it was surprising how few used the term kinetic energy in their explanations of these systems and how many seemed to believe that regenerative braking makes use of frictional heat. A similar lack of detailed understanding was apparent when some students were writing about fuel cells.

(b)   There were also some excellent answers to this question. A small number of students failed to distinguish between aquaculture and conventional fisheries.

(c)   This title gave rise to the greatest number of poor responses. When tackling any essay title students should always bear in mind that fourteen of the twenty available marks are awarded for scientific content. The emphasis here is clearly on the word *scientific*, but this was not apparent in many of the essays seen. Mention of the throw-away society might easily have led on to discussion of the environmental impacts of landfill sites, while the point about increased meat consumption, as a consequence of increasing affluence, should at least have elicited a few lines about food-chain inefficiency and organic matter pollution of water bodies. There were far too many mentions of affluence permitting the adoption of 'green' or 'environmentally friendly' renewable energy systems but far too few answers distinguishing, for example between photovoltaic and photothermal systems.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the **Results statistics** page of the AQA Website.

UMS conversion calculator www.aqa.org.uk/umsconversion