

Environmental systems & societies

Overall grade boundaries

Standard level

Grade:	1	2	3	4	5	6	7
Mark range:	0-13	14-27	28-39	40-51	52-63	64-75	76-100

Standard level internal assessment

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0-7	8-14	15-19	20-24	25-29	30-34	35-42

General comments

The number of candidates for the November exam session continues to be small compared to the May session. The November 2016 session had 961 candidates (763 English and 198 Spanish) compared to 849 candidates in November 2015 demonstrating a continuing but steady increase (this time of 13.19%). The number of schools also rose from 99 to 114 (increase of 15.15%).

The range and suitability of the work submitted

This November session is the last of the old model, and teachers reading this are most probably finishing the first year of the new model. This report should be read in conjunction with the May report as the comments are very similar. All of the current skills are completely transferable to the new model and so many teachers may find that what they are doing will be applicable to the new course. The biggest difference

is that all candidates must produce a single piece of work that is to be assessed against all the criteria. Please note, a PSOW should be completed by the school but not included in the materials submitted.

Candidate performance against each criterion

Planning (PL)

Planning in this last session showed the sample problems as usual. These are focused on difficulty in identifying independent and dependent variables, as well as those that are controlled. For example if a student decided to determine the effect of temperature on photosynthesis of elodea, and decides to use 4°, 7°, 10°, 15°, and 20° these temperatures are not controlled variables, they are variations in the independent variable. This is not a technicality; it is necessary to understand how experimental work is conducted. The distinction is important and in order to be awarded full marks students must understand it this aspect. Some teachers continue to penalize students in Aspect 1 for not indicating how variables are to be controlled. This is assessed in Aspect 2 and should not result in the loss of marks in Aspect 1. The design of good controls is fundamental to experimental work and will be assessed under the new model. In field work, as has been mentioned previously, this can take the form of an unbiased sampling effort. Students commonly lose marks in Aspect 2 for failing to describe their sampling technique adequately. It is not sufficient to indicate that samples were collected randomly; how this was ensured should be part of the method. The requirement to obtain sufficient data is often not met because students engage in work with, for example one seed per treatment. This is surprising because students should have been taught early in the course how to ensure sufficient data for a meaningful study.

Data collection and processing (DCP)

The making of good data tables, with an explanatory title, careful attention to units and detail, will continue to be crucial for IA work. The preparation and organization of data is a fundamental skill for good science and the new model does not change this. In this sense, teachers really need to focus on data collection, organization and presentation early on in the course. Various candidates lost marks for using data cell wrapping features in spreadsheet programs when the datum did not fit in the individual cell. This is inappropriate and results in the loss of marks. Students should give consideration to the presentation and readability of their data. For example if a data table won't fit on to the standard page size paper size, a table can be spread over several pages, taking care to ensure that all the information is clearly presented and readable. Data processing was excellent in some programs, showing skilled use of simple statistics and more complex metrics. However in other programs, the most that students ever do is calculate an average. As has been mentioned before, normally this will result in the loss of a mark. A few schools continue to lose marks in Aspect 3 for graphing raw data.

Discussion, evaluation, conclusions (DEC)

The weakest aspect of this criterion continues to be the first. There were some extraordinarily detailed and sophisticated discussions and others that were a simple retelling of the data. Length becomes a key issue in the new model as there is now a word limit, a feature that was not present in the previous model. This means that there is a premium on efficient writing and this may require training, especially for students writing in their second language. The discussion requires that students identify patterns, look at the quality of their data and place their work in context. These skills are still required but are distributed slightly differently in the new model. It is important that teachers read the [teacher support material](#) available on the OCC carefully to ensure that their students produce what is required. The evaluations varied from excellent to very poor. Candidates in weaker schools still produce evaluations that are very centered on student

performance, more suitable for assessing personal skills. Finally, poorer conclusions continue to suffer from a lack of supporting data and insufficient explanations.

The transition to the new model will require some adjustment in what students produce. The core is the same, but the criteria for context, applications and communication are new and require that students be prepared adequately. The context will be particularly challenging for some students, given the word limit.

Standard level paper one

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0-6	7-13	14-21	22-25	26-30	31-34	35-45

General comments

There was limited G2 feedback for this session. Nevertheless, all the G2 respondents considered the paper to be appropriate and of either similar standard or easier than last year. They also considered the clarity and presentation to be either very good or excellent. The respondents agreed that the questions were accessible to all candidates with learning support and irrespective of religion/belief system, gender or ethnicity.

The mean mark for November 2016 of 19.21 was lower than that for November 2015 and November 2014 of 22.8 and 20.03 respectively. The new schools (which comprised 237 candidates) and the Spanish schools both had a much lower mean of 14.81 and 14.88 respectively. The reasons for this should be explored more fully and an attempt made to address this discrepancy.

The areas of the programme and examination which appeared difficult for the candidates

- Providing the level of detail required, e.g. effects of acid deposition.
- Disadvantages of modelling.
- Recognising primary succession.
- Understanding what is meant by abundance of plant species and confusion with the Simpson Diversity Index.
- Second law of thermodynamics and entropy.
- Causes of turbidity.
- Providing comprehensive definitions of key terms.

The areas of the programme and examination in which candidates appeared well prepared

- Use and interpretation of graphs and tables.
- Causes of previous mass extinctions.
- Identifying factors that make a species less prone to extinction.
- Using quadrats and random sampling methods.
- Pyramid of numbers and productivity.
- Causes of acid deposition.
- Advantages of renewable sources of energy over fossil fuels.
- Understanding differences between point source and non-point source pollution.

The strengths and weaknesses of the candidates in the treatment of individual questions

- 1a) The majority of responses were correct. A frequent mistake was to incorrectly calculate the range or omit 'billion' from the number.
- 1b) Generally candidates responded well to this question with most achieving either 1 or 2 marks. Common error was to state there was an increase or decrease in birth/death rates without identifying the factor that could cause this change.
- 1ci) & 1cii) There were some excellent responses however a significant number of candidates suggested there would be fewer resources available without linking to an economic change (e.g. increase in price of goods) or the environmental implications of using more natural resources (e.g. deforestation).
- 1di) The majority of candidates correctly identified an advantage of using population models.
- 1dii) Many candidates gave a vague response e.g. the model is inaccurate/imprecise without explaining a reason for this.
- 2a) Most students were able to state two correct reasons.
- 2b) Most candidates were able to identify at least one way in which current extinction is different from past mass extinctions.
- 2c) This question was answered well by the majority of candidates. Some responses identified a factor but did not give an explanation
- 2d) Responses to this question varied widely from well-focused answers to those that gave a vague description of evolution.
- 3a) A significant proportion of candidates did give the correct response. A common mistake was to state volcanic eruption or zonation as the process.
- 3b) Most candidates achieved some marks for this question, with many correctly suggesting the use of random sampling strategy and quadrats. Many answers incorrectly included Lincoln Index or Simpson Diversity Index and confused determining abundance of species with species diversity.

- 3c) Marks varied widely between 0 and 4 for this question. Some responses were too vague e.g. referred to climate without linking how higher/lower levels of sunlight/rainfall/temperature would affect plant diversity at each specific location.
- 4a) Most candidate correctly responded to this question.
- 4b) Few students gave a comprehensive definition of net primary productivity. E.g. 'per unit area per unit time' was frequently omitted.
- 4c) Most candidates demonstrated limited understanding of the second law of thermodynamics and responses lacked sufficient detail e.g. marks were lost for not explaining how energy was lost through the trophic levels.
- 4d) In general this question was well answered by most candidates.
- 5a) Most candidates answered this question correctly.
- 5b) Many of the responses were too general and did not relate to the pattern of acid deposition on the map.
- 5c) Few candidates provided a comprehensive answer. Most responses were too vague (e.g. acid deposition causes death of plants/organisms) and lacked the detailed required (e.g. acid deposition leaches nutrient from the soil which reduces plant productivity).
- 5d) There were a large proportion of very good responses to the question.
- 6a) Very few students were able to provide a comprehensive definition of biochemical oxygen demand.
- 6b) Most students achieved a mark for describing changes in turbidity level along the stream. Few candidates were able to explain the cause of turbidity or give reasons for the changing levels.
- 6c) Most candidates achieved some marks for this question but few achieved the full 3 marks. Many responses overly discussed eutrophication without reference to the curve.
- 6d) This question was answered well by most students.

Recommendations for the teaching of future candidates

- Ensure students understand key terms and concepts and are able to apply this to different situations and scenarios.
- Ensure students understand the requirements of each command term.
- Emphasize the importance of reading questions carefully with attention to the number of marks allocated and train students on how to provide specific answers with sufficient detail.
- Ensure students practice interpreting graphs and charts.
- Ensure students practice calculations based on data from figures.
- Advise students not to write outside the box or leave responses blank.
- Cover the whole syllabus in sufficient detail.

Standard level paper two

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0-7	8-15	16-21	22-30	31-38	39-47	48-65

General comments

No comments were received for this paper. This seems rather unusual compared to previous years and might be because they thought the exam had been set at an appropriate level.

The mean mark for November 2016 of 27.71 was lower than that for November 2015 (30.21). The new schools (which comprised 237 candidates) and the Spanish schools both had a much lower mean of 22.22 and 19.25 respectively. The reasons for this should be explored more fully and an attempt made to address this discrepancy.

The areas of the programme and examination which appeared difficult for the candidates

- Most candidates underperformed in the long questions (with 4 marks or more), with some exceptions in Q1e.
- In Section B answering the extended response questions has generally been the difficult section for many candidates, especially answering the questions that demand higher order thinking skills such as explain, evaluate and discuss. The discuss command term seldom produces the overall conclusion part for the question.
- Some candidates are still trying to incorporate the three parts of the essay into continuous prose. This can mean they focus on one part, not always the part with the most marks available.
- 'Evaluate' and 'discuss' are the command terms that are most commonly misunderstood. Only strong candidates gave the balancing/arguments and a conclusion. Assessment objective 4 stresses the need to make reasoned and balanced judgments using appropriate economic, historical, cultural, socio-political and scientific sources. Only the very best candidates were able to demonstrate this balance.
- Many candidates confuse the term "climax" in Question 2a as they thought they needed to talk about succession.
- Question 2c identified that increased economic development led to more resource consumption; sometimes they would link it to meat consumption. Another occasional marking point was the linking of increased economic development to the reduction of ecological footprint with technology. After this very little was clearly identified.
- Very few candidates were able to explain suitable research methods in Question 3b.
- Question 4a also proved problematic for students understanding the differences between bioaccumulation and biomagnification.

- In Question 5a candidates had some understanding of Global Warming (GW) and Ozone depletion (OD), but failed to make direct distinctions, and as a consequence, most students poorly answered question 5b. The causes of GW were mostly understood, not so much the causes of OD, although they failed to link the impact of those issues on coastal ecosystems.

The areas of the programme and examination in which candidates appeared well prepared

- In Section A short answer questions in this section were attempted and answered correctly by most candidates.
- The straightforward command verbs 'state', 'suggest', 'outline' and 'identify' questions were well answered.
- The processing of information from the resource booklet was carried out competently.
- Question 2c linked to economic development.
- Question 3c linked to the conversion of tropical rain forest into agriculture.
- Question 5c linked to EVS's.

The strengths and weaknesses of the candidates in the treatment of individual questions

Section A

Question 1

- a) Only a very small minority gave an incorrect answer here, as long as, they knew what a biome is; it was occasionally confused with ecosystem.
- b) Most answers managed to gain one mark. The answers commonly confused man-made sources of water like "dams", so some candidates did not meet the second mark.
- c) The candidates understood the concept of the question and most gained the 2 marks. But a minority did not gain credit since they described economic or social aspects instead of those that are ecologically significant.
- d) Most candidates answered well, with a few exceptions that didn't realize that 'outline' needs reasoning to obtain full marks, and just stated "r-strategist".
- e) The candidates generally had no problems; nevertheless some candidates couldn't read the diagram, so it was hard to get full marks since two conclusions were needed.
- f) Most candidates managed 2 marks here, but some ability of written expression was needed to get the three marks.
- g) Many candidates rarely answered correctly struggling between renewable and replenishable; mixed responses some knew, some did not.

- h) Most candidates got the two marks.
- i) The candidates could often identify supply/demand principles to the value of a resource; nevertheless, some candidates forgot to link their reasoning to a specific change in value, making 2 max as a result.
- j) Since there were two possible answers depletion and pollution of water resources, most candidates performed well, except for a few who were unable to state the cause of the water pollution.
- k) Most candidates gained the full mark, with a small percentage unable to perform even the simplest mathematical calculations.
- l) Very few candidates were able to get 4 marks, since no clear and explicit links to ecocentric viewpoints were made. Usually they could identify biorights and at times the pollution of groundwater, but not much further.

Section B

Question 2

- a) Was rarely answered well, candidates were able to identify a climatic factor, but usually couldn't elaborate or identify an edaphic one so clearly. The effect on the final climax community was often missing.
- b) Candidates mostly got four points on this question, they usually identified one degradation example with a strategy, explanation was often lacking.
- c) Candidates who answered this generally identified that increased economic development led to more resource consumption, and sometimes they would link it to consumption of meat. Another marking point they would occasionally earn was that increased economic development could reduce footprint with technology. After these points, very little was clearly identified. Even those candidates who successfully answered the question often missed out a conclusion.

Question 3

- a) If the candidate was able to identify a historical influence they usually handled it very well, but some very vague influences were mentioned.
- b) Candidates rarely performed well in this question, they tried to determine species abundance or diversity but without much detail of how to do it, probably due to lack of teaching of ecological methods. Social factors were rarely addressed.
- c) Most candidates answered this question successfully. Most could identify the loss in biodiversity and the strongest candidates discussed the vulnerability of TRF soils. Mostly in Q3, (a) & (c) were well answered.

Question 4

- a) Candidates usually earned one or two marks, but only a handful of candidates could demonstrate a true understanding of biomagnification. Very few scored the maximum 4 marks as there is confusion on the terms bioaccumulation & biomagnification.
- b) This question was handled well by many candidates. They could usually identify two factors easily, with at least one explanation for each, but few achieved the full marks since they lacked depth.
- c) Most students identified a couple of advantages and disadvantages for their chosen strategy. Q4 was the most popular. Similarly, the case on Pollution Management Strategy's (Q4c); most achieved 3-5 marks. Some excellent responses. Lacking detail, thorough explanation of the content.

Question 5

- d) Many candidates often had some partial understanding of GW and OD, but often failed to make clear distinctions. The command verb posed a high difficulty so students achieved low scores for this question.
- e) Those candidates who understood the difference between GW and OD would generally earn a couple of points for global warming, and identify one for OD. Most students will describe mostly terrestrial ecosystems. Students seemed to lack understanding on the subject since they mainly got 3-4 marks at the most on this question.
- f) Candidates seemed to have some understanding on the characteristics of the value systems but many failed to apply them specifically to strategies to address GW. The main problem remains the reading and interpretation of the question. It seems that if the question includes "Environmental impact assessment" they explain everything they know about EIA without actually answering the question.

Overall, this paper was well balanced and questions were clear. In general, questions were straightforward without being overtly easy. Section B followed a pattern of gradually increasing the level of difficulty. Since questions were not hard, most students understood what was being asked; moreover, it was possible to differentiate the excellent students while helping the below average students to get some marks.

Recommendations and guidance for the teaching of future candidates

The following is a summary of the advice for teaching future candidates:

- Review the meanings of command terms so students know what is required in each question. Especially for level 3 command terms.
- Encourage students to make annotated diagrams large and clear if they are using them.
- Make sure students pay attention to the "point value" for each question to gauge how many different and distinct statements they need to address to earn full marks. Encourage candidates to give clear, diverse and discreet marking points, rather than a single vague, limited, and repetitive discourse.
- Encourage students to break up their answers into the relevant sub sections clearly labelling each section to make it easier for the examiner to identify which part of the question they are answering. The answers are NOT expected to be one long essay.

- Ensure sufficient time is dedicated to the teaching of the systems and values elements of the course. To enable the holistic nature of the course to be recognized and used in the answers.
- Reinforce the importance of learning key definitions and terminology, making sure they are able to apply the concepts in everyday situations.
- Clarify how expression of ideas marks are allocated and perhaps use them in your own marking so students get used to developing their answers, including examples and structuring their ideas.
- Candidates should be encouraged to write within the space provided within the exam paper.
- Please encourage students to print specific examples, as these are often hard to interpret when the handwriting is bad. Special arrangements should be made for those students with bad handwriting so that they can type their answers and not lose marks if the examiner is unable to read their response. Some candidates are writing outside the box; this should be avoided since the candidate might lose points here too.
- Detailed examples/case studies are needed for all areas of the syllabus. Local ecosystems should be used and then the inter-relationships can be explicitly noted.