



Course Report 2018

Subject	Environmental Science
Level	Higher

This report provides information on the performance of candidates. Teachers, lecturers and assessors may find it useful when preparing candidates for future assessment. The report is intended to be constructive and informative and to promote better understanding. It would be helpful to read this report in conjunction with the published assessment documents and marking instructions.

The statistics used in this report have been compiled before the completion of any Post Results Services.

Section 1: comments on the assessment

Summary of the course assessment

The number of presenting centres continues to increase, with 10 new centres this year. The total number of candidates presented decreased slightly, and efforts over the coming year will focus on increasing the number of presenting centres and candidates. Statistics show that 86% of candidates entered with no previous experience of environmental science. The majority of candidates picked up the course in S6.

Evidence suggests that this course continues to be delivered by teachers and lecturers from a broad range of science disciplines, predominantly biologists and geographers, but also chemists and physicists, and some co-delivery is common. The mix of skills and specialist knowledge from these disciplines is often apparent in candidate responses, and makes for interesting discussion and knowledge transfer at the central marking events. Marking instructions for the question paper are updated at these events, aiming to reflect the various approaches used in different subjects. They provide a useful teaching aid for teachers and lecturers.

Performance in both course components improved compared to 2017 results. An upward trend for both components of assessment is very encouraging but, with such a small cohort in comparison with other sciences, year-on-year analysis must be treated with caution.

The results show that candidates are coping well with the assignment, with some very interesting topics presented and high marks awarded. The question paper is often viewed as more challenging, but candidates coped well with this year's paper and demonstrated good breadth and depth of knowledge and understanding of environmental science.

Component 1 — question paper

The question paper sampled the entire course and was structured in the same way as the specimen question paper. It consisted of an 80-mark restricted-response section, followed by a 20-mark extended-response section. The question paper comprised approximately 75% knowledge and understanding and 25% problem solving. Candidates are required to demonstrate the breadth and depth of their knowledge and understanding, including applying this to new situations. Approximately 25 marks across the question paper (and 5 marks across the assignment) are intended to be challenging, aimed at grade A.

The restricted-response section included questions worth 1 to 3 marks, often with a cross-unit approach. The extended-response section included both structured and unstructured questions, with candidates offered a choice from pairs of topics each worth 10 marks. Statistics reveal the structured and unstructured options were of equal demand, and a number of candidates achieved full marks.

The question paper performed as intended and feedback has been positive. In addition to accurate recall, candidates continue to demonstrate good lateral thinking skills, especially in 'suggest' questions, which allow them to bring in their own experiences and knowledge from other subjects. Extended responses appear to have fared better than short answers, where brief statements or phrases often failed to provide a satisfactory response. Markers noted that literacy skills seemed weaker this year. There were fewer bullet-pointed responses than

in previous years. Some very low marks on the question paper suggest that some candidates may have been presented inappropriately.

Component 2 — assignment

The assignment performed as expected, with the mean mark continuing to improve year on year, and an increasing number of candidates achieving full marks.

Candidates investigated a wide range of topics. The majority of candidates were well prepared. The majority of this year's assignments were investigative, and an increasing number involved experimental or fieldwork activities. Experimental or fieldwork will be a mandatory feature of the course from session 2018–19.

Section 2: comments on candidate performance

Areas in which candidates performed well

Component 1 — question paper

Candidates generally performed well in questions involving accurate recall and in dealing with unfamiliar contexts.

Candidates performed particularly well in the following questions.

- Q1 (a) (ii) Explaining why several samples were taken at each site.
- Q2 (c) (i) Suggesting why climate change will have a greater impact on ELDCs.
- Q2 (c) (ii) Suggesting why poorer people in EMDCs may suffer more than richer people.
- Q3 (a) (ii) Suggesting reasons for variation in barley yields from year to year.
- Q3 (b) (i) Calculating a mean.
- Q3 (b) (ii) Calculating a range.
- Q3 (b) (iii) Stating an edaphic factor that barley farmers attempt to control.
- Q3 (c) Explaining the benefit to farmers of adding seaweed to arable soil.
- Q3 (d) Suggesting why brown earth soil is better suited to growing arable crops than podzols.
- Q4 (a) (i) Calculating a simple whole-number ratio.
- Q4 (a) (ii) Suggesting why it is difficult to produce accurate population numbers for roe deer.
- Q4 (b) (i) Stating the term *carrying capacity* in response to the definition.
- Q5 (b) (iv) Stating a subterranean water supply that could be contaminated by fracking.
- Q5 (c) (ii) Calculating the shale gas production value.
- Q5 (c) (iii) Completing the bar graph.
- Q6 (a) Describing a negative impact of *Rhododendron ponticum* on native plant diversity.
- Q6 (c) Describing the impact of an invasive non-native animal species on biodiversity.

- Q6 (d) (i) Stating why correct species identification is important in nature conservation.
- Q6 (d) (ii) Completing the paired statement key, by providing the full description in each statement, for example 'petal colour red' or 'leaf shape oblong-ovate' and not just 'red' or 'oblong-ovate'.
- Q7 (d) (ii)B Suggesting a strategy for the transport industry to reduce emissions.
- Q7 (d) (iii) Stating the term *indicator species* in response to the definition.
- Q8 (a) (i) Stating why there is increased demand for food worldwide.
- Q8 (a) (ii) Naming a land-based strategy for increasing food production and explaining a social, an economic, and an environmental impact of this strategy. This question was well done in general, but candidates fared less well with the social impact.
- Q8 (b) Generally, suggesting an impact of monoculture planting on producers and biodiversity was done well, but candidates fared less well with the consumer aspect.
- Q8 (c) Generally, suggesting how food waste could be reduced by households and supermarkets was done well, but candidates were less sure of how it could be reduced in schools and colleges.
- Q9 All candidates attempted question 9 (structured essay).

Mean marks for the structured essays were lower than last year.

Fewer candidates attempted question 9A on a life cycle analysis, than question 9B on safe water supply. In most cases, candidates were familiar with the roles of the UN and NGOs in the supply of safe drinking water (part b), but for part (a) the majority discussed methods to **supply** water rather than improve the **quality** of the water supply.

- Q10 All candidates attempted question 10 (unstructured essay).

Mean marks for the unstructured essays were better than last year.

Most candidates attempted 10A on the advantages and disadvantages of processed biofuels. Far fewer candidates attempted 10B on terrestrial biomes.

Component 2 — assignment

Aim	Almost all candidates achieved the mark for providing a clearly stated aim.
Underlying science	Most candidates achieved more than half marks and a significant number achieved full marks. A holistic approach is used when marking this section and candidates demonstrated a good understanding of their chosen topic and at a depth appropriate to Higher level.
Selecting information	Most candidates were able to select two pieces of data/information relevant to their investigation that allowed them to draw a conclusion.
Processing and presenting data/information	The majority of candidates used appropriate presentation formats, and correct headings, labels, units and/or scales. Most candidates also cross-referenced sources appropriately.
Evaluation	Marks for this section were better than last year, with a majority of candidates achieving 2+ marks. However, candidates continue to struggle with the difference between the terms 'reliability', 'validity' and/or 'robustness'.
Presentation	Most candidates achieved the mark for title and structure. Most candidates are now following the instructions for candidates, to structure their assignment with clear headings.

Areas which candidates found demanding

Component 1 — question paper

- Q1 (c) (i) Defining *biological oxygen demand* (BOD). The majority of candidates did not refer to *decomposition of organic matter*, which is a key part of the BOD definition.
- Usually, definition questions are poorly done. In contrast, questions where the definition is provided and candidates are asked to state the term are very well done. A comprehensive glossary has been prepared for the revised course to address this.
- Q1 (c) (ii) Giving a reason for the difference in BOD values between the two sites. Even without a good understanding of BOD, it was expected that candidates would be able to draw a conclusion from the information in the question, plus their own knowledge of freshwater indicator species (mandatory knowledge: stonefly larvae and blood worms).
- Q2 (a) Defining *sustainable development*. The majority of candidates gave a definition of sustainability (a balance between environmental, economic and social factors) rather than sustainable development.

- Q2 (b) (iii) Explaining what is meant by the *circular economy model*. Some candidates did not attempt this question.
- Q2 (d) Describing the roles of the IPCC.
- Q5 (a) Stating the main component of shale gas. Many candidates were unaware that the main component is methane.
- Q5 (b) (iii) Describing the function of sand and chemicals in the fracking process. Most candidates could explain why sand is used, but not chemicals.
- Q5 (c) (i) Predicting the impacts on the global environment of China's increasing use of shale gas. Many candidates discussed local impacts on the environment (for example water contamination) rather than global impacts such as climate change.
- Q6 (b) Describing how to minimise the spread of *Rhododendron ponticum*, was poorly done by many candidates.
- Q7 (a) Stating the main anthropogenic source of sulfur dioxide emissions. Many candidates were unable to state a correct source.
- Q7 (b) Describing the role of atmospheric circulation in the deposition of acid rain originating from sulfur dioxide emissions released in Scotland. Some candidates did not attempt this question, a minority achieved 1 mark, and few achieved full marks. Candidates often provided a diagram or description of the tri-cellular model, but then failed to link it to the movement and deposition of acid rain.
- Q9 A **Life cycle analysis essay**
 A significant number of candidates achieved 0 marks because they did not discuss a named product or were not familiar with the LCA process.
- Discussion of composite items (for example a mobile phone) fared less well than single material items (for example a plastic bottle), so candidates should focus on more straightforward items.

Component 2 — assignment

Processing and presenting data/information	<p>Where graphing packages are used, there is a requirement to include both major and minor gridlines. Many candidates failed to include the minor gridlines and, consequently, did not gain the processing mark. Placing values above plotted points is not acceptable as a substitute for including minor gridlines.</p> <p>Some candidates did not achieve the mark for headings/labels/units/scales, typically failing to include axis label(s) and/or units on graphs and tables.</p>
Analysing data/information	<p>Approximately one in three candidates failed to achieve a mark in this section, suggesting they struggle with interpreting their findings to identify trends and relationships.</p>
Conclusion(s)	<p>As in previous years, candidates frequently confuse 'conclude' with 'evaluate'. The conclusion must relate back to the aim(s) and be supported by data/information in the report.</p>
Presentation	<p>The number of candidates who achieved the mark for referencing was lower than last year. Although most candidates placed citations/references within the body of the report (and gained the cross-referencing mark), there is a requirement that references are listed at the end of the report (before any labelled appendices).</p> <p>Candidates undertaking experiments or field work activities frequently failed to reference the source of their raw data. The title of the activity and its aim should be included in the reference list at the end of the report.</p>

Section 3: advice for the preparation of future candidates

Component 1 — question paper

Following consultation with teachers and lecturers, the mandatory content for this course has been revised for session 2018–19. A significant volume of content has been removed, clarified or expanded, and the revised content has been restructured into a more coherent exploration of environmental science. Each section contains a list of terms that candidates should be familiar with and able to use appropriately, and a comprehensive glossary containing these terms has been prepared to support teachers, lecturers and candidates.

The revised course will be assessed via two question papers and an assignment. Information about these assessments is available in the *Higher Environmental Science Course Specification* and is covered in detail in a presentation with audio (available on the Higher Environmental Science section of SQA's website). Teachers and lecturers are encouraged to attend the Understanding Standards event for this course and/or access the materials that will be available on the Understanding Standards website after the event.

It is recommended that candidates are provided with a copy of the table showing mandatory content (available in the course specification), so they can familiarise themselves with phrasing and terminology used in the section headings and sub-headings in the first column, as these are often included in question stems, especially the extended-response questions.

Past question papers and the new specimen question paper can be used to prepare candidates. Marks are frequently lost through misunderstanding command words, so teachers and lecturers are encouraged to incorporate these into teaching at an early stage. Command words continuing to cause problems for candidates include:

- ◆ describe — provide a detailed statement, more than an outline or list
- ◆ explain — a detailed coverage of a topic, typically requiring discussion of a cause and effect or a relationship
- ◆ conclude — arrive at an objective judgement or opinion through reasoning, based on available evidence
- ◆ evaluate — make a subjective judgement based on criteria; or determine the value of something

Use of 'suggest' is common in Environmental Science question papers, allowing candidates to demonstrate lateral thinking and/or draw on their own experiences and knowledge.

While some candidates avoid tackling graphing questions and calculations in the question paper, it is important they practise these, especially calculations including large values and statistics. Statistical formulae are provided in question papers where appropriate, and candidates should be familiar with substituting values in formulae and interpreting the results.

All candidates attempted both extended-response questions (questions 9 and 10), suggesting that time management continues to improve. Candidates should be encouraged to plan their extended-responses (and include the planning notes), perhaps at the start of the exam. Planning notes will be marked if it is obvious the candidate has run out of time —

providing the notes have not been scored through. Practise in writing extended-responses, without bullet points (unless as lists or points that are then further expanded) should be encouraged. Candidates should be encouraged not to write brief statements or phrases that fail to provide the expected response.

Component 2: assignment

From 2018–19 onwards, the assignment must be based on data generated through experiments or fieldwork. The revised assignment structure and mark allocation are included in the *coursework assessment task for Higher Environmental Science*.

Teachers and lecturers must provide candidates with unaltered copies of the instructions for candidates that can be taken into the report writing stage. It is also recommended candidates are supplied with the assignment marking instructions, which must not be taken into the report writing stage. Teachers and lecturers should ensure that candidates are fully prepared and understand what is expected of them. Teachers and lecturers must not read the reports at any stage nor provide feedback. Re-drafting of a report once the final effort has been submitted is not permitted.

While it is likely that the choice of practical activity will be decided by the teacher or lecturer, and that time and resource limitations may dictate a need for group work, collaborative experimental or fieldwork should not result in all candidates involved producing very similar reports. Each candidate should independently choose a topic and aim based on the data generated from the experiment/fieldwork, and must agree these with their teacher or lecturer. The candidate should then complete the report on their own and without collaboration with other candidates, or intervention by the teacher or lecturer. Initial class discussion around topics may assist candidates in deciding suitable topics and aims.

The underlying environmental science section has been reduced from 5 marks to 3 marks under the revised structure. This section will continue to be marked holistically, and candidates are advised to consider quality of content over quantity. They should develop the skills of summarising key points from published text, linking key points from different sources and writing in their own words, to better demonstrate their depth of knowledge and understanding. The sources used, and discussion of the content, should be at a level at least appropriate to Higher.

Candidates should practise graphical presentation and, without intervention from the teacher or lecturer, consider which graph format is most appropriate for their data. If using a graphing package, they must ensure that minor gridlines are included.

Candidates should practise data analysis. Where one experiment/fieldwork activity has been carried out, they must compare their data with an internet/literature source of data. If two experiments/fieldwork activities have been undertaken, they must discuss both sets of generated data.

From 2018-19, evaluation of the investigation must include experimental/field work methodology, results, and/or data obtained from internet/literature sources. A maximum of 1 mark is now available for evaluating data source(s). Candidates should be encouraged to critique all steps of their investigation and supply appropriate justification.

SQA's criteria on assessment conditions are published on the website and in course materials and must be adhered to. SQA takes very seriously its obligation to ensure fairness and equity for all candidates in all qualifications through consistent application of assessment conditions and investigates all cases where conditions may not have been met.

Grade boundary and statistical information:

Statistical information: update on courses

Number of resulted entries in 2017	454
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Number of resulted entries in 2018	423
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Statistical information: performance of candidates

Distribution of course awards including grade boundaries

Distribution of course awards	Percentage	Cumulative %	Number of candidates	Lowest mark
Maximum mark				
A	19.1%	19.1%	81	84
B	24.3%	43.5%	103	72
C	21.3%	64.8%	90	60
D	10.2%	74.9%	43	54
No award	25.1%	-	106	-

General commentary on grade boundaries

SQA's main aim is to be fair to candidates across all subjects and all levels and maintain comparable standards across the years, even as arrangements evolve and change.

SQA aims to set examinations and create marking instructions which allow a competent candidate to score a minimum of 50% of the available marks (the notional C boundary) and a well prepared, very competent candidate to score at least 70% of the available marks (the notional A boundary).

It is very challenging to get the standard on target every year, in every subject at every level.

Therefore, SQA holds a grade boundary meeting every year for each subject at each level to bring together all the information available (statistical and judgemental). The Principal Assessor and SQA Qualifications Manager meet with the relevant SQA Business Manager and Statistician to discuss the evidence and make decisions. The meetings are chaired by members of the management team at SQA.

- ◆ The grade boundaries can be adjusted downwards if there is evidence that the exam is more challenging than usual, allowing the pass rate to be unaffected by this circumstance.
- ◆ The grade boundaries can be adjusted upwards if there is evidence that the exam is less challenging than usual, allowing the pass rate to be unaffected by this circumstance.
- ◆ Where standards are comparable to previous years, similar grade boundaries are maintained.

Grade boundaries from exam papers in the same subject at the same level tend to be marginally different year to year. This is because the particular questions, and the mix of questions, are different. This is also the case for exams set by centres. If SQA alters a boundary, this does not mean that centres should necessarily alter their boundary in the corresponding practise exam paper.