



EXAMINERS' REPORTS

**LEVEL 3 DIPLOMA IN
ENVIRONMENTAL SCIENCE**

SUMMER 2017

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Annual Statistical Report

The annual Statistical Report (issued in the second half of the Autumn Term) gives overall outcomes of all examinations administered by WJEC.

Unit	Page
Unit 1	1
Unit 2	4
Unit 3	6
Unit 4	8

ENVIRONMENTAL SCIENCE

Level 3 Certificate

Summer 2017

UNIT 1: MANAGING ENERGY FOR A SUSTAINABLE FUTURE

General Comments

The number of centres entering candidates was increased compared to last year.

Administrative work was mostly correct, with authentication sheets signed by the candidates. One centre failed to average candidate marks when an AC applied to both activities. Please note if a candidate has only produced work at a particular AC from only one activity (when both are required), the total mark for that AC should be halved. Centres should note that when awarding mean marks from 2 activities for an AC, any half marks should be rounded up.

The following best practice was generally seen:

- Numbering and indexing pages, meaning that evidence for ACs could be easily located.
- Annotation where ACs were clearly referenced in the margin.
- Justification for the choice of banding for each AC.

The following comments should be considered in conjunction with last year's Principal Moderator's report.

Activity 1

To obtain top band marks in activity 1, both energy devices tested should show evidence of band 3 standard. If this is not the case then a 'best fit' mark should apply.

Task 1

AC4.1: The planning section of the experiment was carried out very well but very few candidates gave any indication of how they were going to manage their time. This prevented several candidates from achieving the top band in this criterion.

Task 2

AC4.2: This AC was generally well done by candidates.

AC 4.3: To achieve the top band in this criterion, candidates should note the precision of the instruments used (e.g. in the apparatus list the ammeter has a precision of ± 0.001 A). Also I would expect to see repeated results in order to get sufficient data.

AC4.4: This AC was generally done well by all candidates. They collected the data that was stated in the plan.

Task 3

AC4.5: This AC was generally addressed well. However, candidates need to show the equations that were used, and how these equations are used. To achieve the top band for this criterion, I would expect the correct use of significant figures in line with the precision of their instruments.

AC4.6: Candidates produced very good graphs and most drew Sankey diagrams to scale for their devices.

AC4.7: This AC was vastly improved compared to last year. Candidates made good attempts at evaluating their procedures.

AC5.1: This AC was generally well done. Please note that in order to award a middle band mark (or higher), column headings should be mostly correct, with symbols and units.

AC5.2: To achieve a top-band mark in this criterion, candidates should ensure suitable sizes and scales are consistently used and the plots are connected by an appropriate line of best fit. A number of candidate marks were marked down by the Moderator due to failing to add best fit lines to computer-generated results.

Task 4

AC2.1: The majority of candidates achieved bottom band and low middle band marks for this AC. To achieve the higher marks, knowledge and understanding must be above the level expected at GCSE. Candidates also need to apply mathematical formulae to achieve higher band marks.

AC2.3: The majority of candidates performed badly in this AC. To get out of the bottom band I would have expected to see some description of the working of both devices in a reasonable amount of detail. Candidates should discuss the conservation of energy in relation to the practical tasks in order to attain a top-band judgement.

AC3.2: This criterion was generally well attempted this year.

AC5.3: This criterion was generally well done.

AC5.4: In this criterion the candidates should make recommendations from their own work.

AC5.5: Most candidates producing structured reports using appropriate language, punctuation and grammar.

Activity 2

Task 1

AC3.1: This criterion was generally well done by candidates.

AC4.1: Candidates produced a table and/or proforma to show the information they needed to collect in order to perform the audit and/or gave good written descriptions. The lack of time planning prevented many candidates from achieving top band marks.

Task 2

AC4.5: Most candidates made good attempts at calculations involving R- and U-values, and pay-back times.

AC4.6: When this criterion was attempted, candidates generally plotted a relevant chart.

AC4.7: Candidates made good attempts at evaluating their procedures.

AC5.1: For this criterion all candidates drew tables, but few of their tables showed relevant information extracted from the task and calculated data.

AC5.2: This criterion was generally well done.

Task 3

AC1.1: In order to achieve top band marks for this criterion, candidates should give a definition of sustainable energy.

AC1.2: Candidates seemed to have difficulty with this criterion. There are four areas mentioned in the specification; if only one area is discussed then candidates can achieve the lower band; if two areas are discussed or three areas (but done poorly) candidates can achieve middle band marks; Three or four areas done well will allow candidates to achieve top band marks.

AC2.2: For this criterion candidates should explain the process of heat transfer through the walls, ceilings, and insulation materials in terms of conduction, candidates mentioned the physical explanation of conduction through solids and hence achieved bottom band marks.

AC2.3: The working of solar panel needs to be explained in detail to obtain top band marks for this criterion. When this was attempted it was well done.

AC3.2: For this criterion, candidates were generally able to explain how energy is lost from the building as a whole. To improve attainment in this criterion they need to further identify by what methods heat is lost from the building.

AC3.3: This criterion was generally well attempted.

AC5.3: This criterion was not done well, with very few Sankey diagrams drawn for this task.

AC5.4: This criterion was generally well done.

AC5.5: Most candidates wrote good structured reports using appropriate language, punctuation and grammar.

ENVIRONMENTAL SCIENCE

Level 3 Certificate

Summer 2017

UNIT 2: THE LIVING ENVIRONMENT AND CONSERVATION

General comments

Several new centres submitted work for this unit in Summer 2017, with the majority of candidates submitting work in English, as opposed than Welsh, for the first time. Administrative work was correctly submitted, with authentication sheets signed by all candidates.

Activity One

Task 1

AC 4.1 (to obtain data about ecosystems) requires candidates to provide a clear plan, linking the data required with the methods they plan to use to collect the data. This was generally completed well, but there were clear differences between responses, regarding clarity of timings within the parameters of the teacher guidance.

AC 4.2 was generally completed well where candidates were able to describe realistic precautions to be taken.

Task 2

AC 4.3 and AC 4.4 were achieved through a range of tally charts with varied degrees of labelling. Candidates accessed band 3 marks where they were able to demonstrate data that was appropriate and tabulated in a well-organised manner.

Task 3

AC 2.1 and AC 2.2 were generally completed with less detail, and most candidates scored fewer marks, in activity one than in activity two. The degree of detail regarding human impact at the business park was generally only sufficient to receive band 1 marks, with few exceptions.

AC 4.6, which requires candidates to comment upon comparisons between the two locations, tended to be found with AC 2.1 and AC 2.2, and often lack detail and clarity.

AC 4.5 was generally completed well, but several candidates made major errors with their calculations, limiting their marks to band 1 – main errors related to use of significant figures, miscalculating Simpson's index and misreading the significance of T-test results (candidates should be made aware that negative T values must not be treated as such and this has led to candidates incorrectly accepting null hypotheses).

AC 4.7 generally scored marks up to band 2 and consisted of comments related to graphs and raw data. Where candidates were able to link to methods of data collection and processing they were able to access marks in band 3.

Task 4

AC 1.1 requires candidates to give a more detailed description for band 2, but this was generally not evident.

AC 1.2 and AC 1.3: Candidates were clearly able to discuss energy within an ecosystem and the role of decomposers, but the task states that these should relate to the areas studied and candidates should use data collected to support explanations. Candidates who simply discussed energy and decomposers were generally limited to band 1 marks.

Activity Two

Task 1

AC 1.7: Candidates generally provided a very clear and detailed explanation of the process of succession, using the data provided.

Task 2

AC 1.4: Candidates were able to identify and explain how a range of factors (biotic and abiotic) affected ecosystem populations, but they should not focus solely upon human impact.

AC 1.5: Candidates generally did not construct graphs to analyse the data, but descriptions of data trends were generally completed well.

Task 3

AC 1.6 was generally completed well, although candidates should make clearer links to the species and to the mechanisms by which evolution occurs. Links to DNA and mutations enabled candidates to attain band 3 marks.

Task 4

The final task generally scored higher marks when AC 2.1 (describe human activity) and AC 2.2 (explain the impact of human activity) were addressed separately from the conservation section. Such responses gave great detail of types and impact of human activity in the Cairngorms National Park.

AC 3.1 was generally completed well although candidates tended to offer short initial definitions with further qualifying comments distributed throughout sections AC 3.2-4.

AC 3.2 varied greatly. Where candidates were able to break down the problem into clear sections their analyses could allow them to reach band 3, but too frequently the responses were basic and superficial.

AC 3.3 was generally completed well and candidates gave a range of responses for the types of conservation strategy that exist.

AC3.4: Where students were able to give an accurate and coherent explanation of extinction they were able to access band 3 for this criterion, but candidate marks generally reached band 2 only, due to the descriptive, rather than explanatory, nature of the responses.

ENVIRONMENTAL SCIENCE

Level 3 Certificate

Summer 2017

UNIT 3: MONITORING OUR PHYSICAL ENVIRONMENT

General

This is the second year that the qualification has been available and there were more centres who submitted portfolios for moderation. The quality of the work submitted by the centres was varying in quality and assessment. Much of the work was well annotated, which is key to a successful moderation outcome and some assessors showed a very good understanding of the assessment procedures.

It should be noted that candidates should be fully prepared using the booklets provided before attempting the final tasks, otherwise they will be disadvantaged.

The model assessment is split into three parts:-

Activity 1 – Analysis of Stream Water

The activity is split into four parts:

- Planning to collect the sample
- Analysing the sample by volumetric analysis
- Analysing the sample using colorimetry
- Writing a report on their findings.

The learner summary sheet for this activity should be made available to candidates as this details the evidence they need to provide for each relevant assessment criterion.

All candidates provided a report for this section and were able to show that they had good understanding of the techniques used to analyse the samples of stream water. The practical work was assessed using criteria from Learning Outcome (LO) 3 – be able to obtain analytical data on the physical environment.

The report covers aspects of LO1 (chemical notation), LO2 (principles of environmental analysis), LO4 (process analytical data) and LO5 (report on investigations). Most candidates were successful in being able to write good reports, including carrying out calculations and drawing and interpreting graphs, which were well assessed on the whole.

Activity 2 – Drums in the Stream

This activity gives candidates the opportunity to show their understanding of organic chemistry and how to identify inorganic compounds. The quality and coverage of work was varied even within the small sample provided and the best candidates could show their understanding of functional groups and give the names and structures of compounds. Candidates should also be able to draw some excellent results tables within this activity and some were unable to do so, so could not score as well as they should have.

Activity 3 – Contamination in the Niger Delta regions of Nigeria

Here, candidates use their deductive skills in order to identify unknown compounds and they are then able to calculate concentrations and molecular formulae. This was well done and well assessed by the centre.

Again, the quality of the reports written by candidates was mixed. All of the work in this activity is book based, so candidates should spend time on their written reports rather than trying to attempt the practical procedures.

ENVIRONMENTAL SCIENCE

Level 3 Certificate

Summer 2017

UNIT 4: SCIENTIFIC PRINCIPLES AND THE ENVIRONMENT

General Comments

The majority of candidates attempted most questions and all candidates appeared to have had sufficient time to complete the paper. However, a number of candidates failed to express themselves clearly and responded in a very superficial manner. Candidates should use appropriate terminology and specificity in their responses.

Candidates should be reminded to use the mark allocation provided at the side of each question to show the level of detail/description required in a response.

The quality of written communication was an issue for some candidates. They are reminded of the necessity for good English / Welsh on the front of the examination paper.

Simple mathematics caused significant difficulties for many. Some candidates also appeared not to have necessary equipment, such as a pencil and ruler to draw the graph.

Section A

Pre-release Material

- | | | |
|---|-----|---|
| 1 | (a) | Most candidates focussed on the causes of eutrophication rather than definition of the term. |
| 1 | (b) | Many candidates misunderstood the question and gave reasons for an increase in the hypoxic zone. |
| 2 | (a) | The majority of candidates achieved 2 marks, however some misplotted points or forgot to add a line. |
| 2 | (b) | The majority of candidates answered this part incorrectly. They failed to recognise that α radiation is the most ionising. |
| 3 | (a) | Most candidates achieved this mark. |
| 3 | (b) | Many candidates could not state that phytoplankton use carbon dioxide in photosynthesis. |
| 3 | (c) | This question was poorly answered by most candidates. They did not include the necessary detail of the Calvin cycle to gain any credit. |
| 4 | (a) | (i) Some candidates correctly answered that a digital pH meter should be chosen. However no candidate compared this to another method. |
| 4 | (a) | (ii) The majority of candidates recognised that 5 samples were sufficient, however many incorrectly thought that one site was suitable to collect valid data. |

- 4 (b) Most candidates correctly linked pH to carbon dioxide concentration, but none could give a reason for this.
- 5 (a) No candidate answered this part correctly.
- 5 (b) Most candidates achieved the first marking point (calculation of power), but many failed to show their working in the second part.
- 5 (c) A variety of Sankey diagrams were drawn. Almost no one showed their working to calculate either the useful or the wasted energy.

Section B

- 6 (a) (i) Some candidates confused the sugar and the base.
- 6 (a) (ii) Credit was given for named metabolic processes. However many candidates did not give four uses for ATP, limiting the marks available to them.
- 6 (b) Few candidates understood the question and therefore they did not give the precise location of the stages of respiration.
- 6 (c) Candidates clearly did not understand the difference between aerobic and anaerobic respiration.
- 6 (d) Many candidates discussed anaerobic bacteria but did not link to denitrification. They discussed changes in numbers of aerobic and anaerobic bacteria.
- 7 (a) (i) Approximately half of the candidates could recall the equation to calculate pH.
- 7 (a) (ii) Few candidates could use their calculator to calculate the pH when given the H^+ concentration.
- 7 (b) (i) Most candidates could calculate the titre values.
- 7 (b) (ii) Candidates did not exclude the anomalous result when calculating the mean titre.
- 7 (b) (iii) No candidate could correctly write a balanced equation for the reaction of sodium carbonate and hydrochloric acid.
- 7 (b) (iv) Most candidates did not attempt to calculate the concentration of the acid.
- 8 (a) (i) Most candidates gave the incorrect response of 'chain reaction', rather than 'free radical'.
- 8 (a) (ii) Most candidates correctly identified the termination reaction, but instead of a propagation reaction answered with an initiation equation.
- 8 (a) (iii) Most candidates could not recall UV light.
- 8 (b) Some candidates confused ozone with Global warming and the Greenhouse effect.

- 8 (c) The majority of candidates could not label the diagram correctly.
- 8 (d) Most candidates answered that air pollution caused changes in the weather, rather than changes in the weather affecting air pollution as was required.
- 9 (a) Candidates could not give a factor that affects the mobility of metal ions.
- 9 (b) Some candidates could identify copper, but none could identify barium using the given information.
- 9 (c) No candidates could state the test for lead ions.
- 9 (d) (i) Some candidates recognised the equilibrium sign.
- 9 (d) (ii) Few candidates could correctly answer 'polydentate' for this part.
- 9 (e) No candidate correctly used oxidation numbers in their answer. Many correctly identified that bacteria were acting as reducing agents.
- 10 (a) (i) Most candidates could not give a correct definition of power.
- 10 (a) (ii) Most candidates attempted the calculation. Many did not convert between hours and seconds, or failed to cube the wind speed.
- 10 (b) Candidates did not reference kinetic energy in wind. Many candidates could describe energy changes in the generator.
- 10 (c) Simple mathematical errors meant that some candidates who wrote the calculation correctly were unable to get the correct answer.
- 10 (d) Some candidates were unable to use their answer to calculate efficiency.
- 10 (e) No candidates correctly calculated the percentage as they failed to calculate the total energy of the system.
- 11 (a) The majority of candidates did not provide three answers as required in the question.
- 11 (b) Most candidates could not recall that Uranium-235 undergoes a fission reaction.
- 11 (c) Some candidates accurately described the structure of a nuclear reactor (as given in the diagram), but failed to describe the processes occurring within it.
- 11 (d) (i) This question was answered superficially by most candidates. Most candidates answered 'beta'.
- 11 (d) (ii) (I) Half of the candidates could correctly complete the diagram.
- 11 (d) (ii) (II) A variety of incorrect responses were given to complete the path of the β particle between the plates.
- 11 (d) (iii) most candidates correctly answered that 4 half-lives were required. At least half of the candidates divided 5.84 by 4, instead of multiplying it.



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