



EXAMINERS' REPORTS

**LEVEL 3 DIPLOMA IN
ENVIRONMENTAL SCIENCE**

SUMMER 2018

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UNIT 1: MANAGING ENERGY FOR A SUSTAINABLE FUTURE

General Comments

Six centres entered candidates for unit 1 in 2018.

Administrative work was mostly correctly submitted, with authentication sheets signed by the candidates. Most of the work was very well annotated where assessment criteria were clearly referenced in the margin. There were however some instances where some candidate work was not annotated – this made it difficult for the moderators to see where marks were awarded and therefore difficult to agree with the centre's assessment decisions.

The following best practice was generally seen.

Pages were numbered and an index was provided. This meant that it was easy to locate evidence for each assessment criterion. Some centres justified their choice of band for each criterion which was very helpful.

The following comments apply to the current and previous series of assessment. For top band marks the following would be expected:

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 generally carried out very well. However in order to achieve a top-band, candidates should set achievable time scales to carry out their plan.

Task 2

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

AC4.3: 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 has generally improved over each series. For a top band to be awarded candidates are required to evaluate the method thoroughly and describe actions that can improve the quality of the data.

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 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. Candidates also need to define the quantities that they are going to use in their investigations.

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 the context of the practical tasks in order to attain a top-band judgement.

AC3.2: This criterion was generally well attempted.

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 produced 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 some 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. For a top band to be awarded candidates are required to evaluate the method thoroughly and describe actions that can improve the quality of the data.

AC5.1: For this criterion all candidates drew tables, but some 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: Candidates need to use the accepted definition of sustainability and then expand on this by giving examples of methods of reducing dependence on non-sustainable fuels.

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; all four areas done well will allow candidates to achieve top band marks.

AC2.2: To get more than bottom band, as well as basic conservation of energy, candidates need to explain conduction and convection in terms of particles, what is meant by thermal conductivity, and how texture and colour effect absorption and emission of IR radiation, and relate these things to the house in question.

AC2.3: The working of solar panel needs to be explained in detail to obtain top band marks for this criterion. Candidates again need to achieve the bullet points in the specification in the context of the assessment.

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: Few Sankey diagrams were 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.

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UNIT 2: THE LIVING ENVIRONMENT AND CONSERVATION

General comments

New centres submitted work for this unit in May 2018, with the majority of candidates submitting work in English for the second year in a row. Administrative work was correctly submitted, with authentication sheets signed by all candidates. However, some centres are using mark sheets and assignment details from the **specimen** assessment materials, rather than the updated assignments, available from WJEC each year – all sections of this assignment are varied each year and use of the specimen tasks is not permitted.

Activity One

Task 1

AC4.1 (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, as responses are clear and well presented.

AC4.2 was rewarded appropriately where candidates were able to describe realistic precautions to be taken. However, many candidates' responses were superficial and lacked scientific rigour.

Task 2

AC4.3 and AC4.4 were achieved through a range of tally charts and results tables 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

AC2.1 and AC2.2 were generally completed with less detail, and most candidates scored fewer marks, in activity one than in activity two – this may be as a result of using the incorrect mark sheet from the specimen assessment materials, which does not include AC 2.1. The degree of detail regarding human impact was generally only sufficient to receive band 1 marks, with few exceptions – 9 marks are available for AC2.2, so candidates are expected to devote more attention to this section.

AC4.6, which requires candidates to comment upon comparisons between the two locations, tended to be found with AC2.1 and AC2.2, and often lacked detail and clarity. In the case of centres who have dealt with AC4.6 separately marks tend to be far higher.

AC4.5 was generally completed very well this year, with many candidates achieving band 3 scores. Attention has clearly been paid to the teaching of the T-test and Simpson's indices, although some candidates are not aware of the significance of the final calculated figures.

AC4.7 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 – in general this was an improvement from last year.

Task 4

AC 1.1 requires candidates to give a more detailed description for band 2, but this was generally not evident – improvements include linking the definition to the ecosystem being investigated.

AC1.2 and AC1.3: Candidates were clearly able to discuss energy within an ecosystem and a description 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

AC1.7: Candidates generally provided a very clear and detailed explanation of the process of succession, using the data provided – many candidates were able to access band 3 marks.

Task 2

AC1.4: 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.

AC1.5: Candidates generally did not construct graphs to analyse the data, but descriptions of data trends were generally completed well.

Task 3

AC1.6 was generally completed well, although candidates should make clearer links to the species and to the mechanisms by which evolution occurs, rather than simply describing the adaptations of marram grass. Links to DNA and mutations enabled candidates to attain band 3 marks.

Task 4

The final task generally scored higher marks when AC2.1 (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.

AC3.1 was generally completed well although candidates tended to offer short initial definitions with further qualifying comments distributed throughout sections AC3.2-4.

AC3.2 was addressed well this year. Candidates in some centres devoted more attention to the consideration of the main purposes of conservation; however in some centres responses were basic and superficial.

AC3.3 was generally completed well and candidates gave a range of responses for the types of conservation strategy that exist. Marks were higher where candidates structured their work with *in situ* and *ex situ* techniques.

AC3.4: Where candidates 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.

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UNIT 3: MONITORING OUR PHYSICAL ENVIRONMENT

General Comment

The work submitted by the centres varied in terms of the quality of candidates' responses and the assessment of the work. Much of the work was well annotated by the teacher which helps moderation and shows the assessors' understanding of the assessment procedures. Almost all centres completed the Mark Report Sheet fully. This sheet gives the page number of the evidence and the mark awarded for each AC. This sheet is vital to help the moderator check the assessment.

It is essential to remember that this unit is assessed by carrying out a number of tasks set in an environmental context. Centres which were most successful at this unit used the WJEC Model Assignment. Centres are allowed to change this assignment and, if this is done, it is important that the guidelines in the section of the Model Assignment entitled 'Accepted changes to this model assessment' are followed. Failure to do this could seriously disadvantage the candidates.

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

The key to candidates achieving good marks for the assessment criteria is that they show they can apply their knowledge, understanding and skills in the context of the assignment.

Finally, by way of introduction, it was noted that some centres used laboratory books for the candidates to record their laboratory work in. This is good practice and centres that do this are to be commended.

I will comment on key aspects of the completion and assessment of the model assignment.

Activity 1 – Analysis of Stream Water

The activity is split into four tasks:

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

Task 1 Planning and sampling

AC3.1. This AC is about planning to sample. What equipment is needed? Where will the sample be collected from?

A number of plans did not read as plans. Rather, in a few cases the candidates wrote in the past tense and described what they did. The second statement in each band refers to

identifying suitable sampling points. The content refers to accessibility, safety and ease of access. This was not always done.

Task 2 Analysing the sample by volumetric analysis

AC3.4. Candidates did not always read the burette to two decimal places. This restricts the marks to the first band. Please ensure that candidates understand how to read a burette to two decimal places and record their reading to two decimal places.

Task 3 Writing a report on their findings

AC2.1. This AC requires candidates to explain the choice of the sampling technique and the analytical procedures used. Many candidates did the former but not the latter.

AC2.4. Candidates only need to comment on the titration they used in the assignment. The idea that a solution of known concentration and volume is used to measure the concentration of an unknown solution of known volume; that the end point (ie. point of exact neutralisation of acid by base) is determined using an indicator; that volumes are measured accurately using appropriate apparatus; etc. is what we expect from candidates. It is not necessary for candidates to recall indicator theory.

AC4.5. Significant figures cause problems for many candidates. Either far too many significant figures are used or there is excessive rounding up of figures.

AC5.3. There is no need for candidates to word process this report although it can be done, if preferred. However, candidates who do use word processors are more inclined to make errors with chemical formulae and equations than those who do not.

Activity 2 – Drums in the Stream

Task 1

AC1.1. It did not appear that all candidates listed the possible functional groups present before they started the task. This should be straight forward (e.g. carboxylic acids, RCOOH etc.).

After completing the analysis, they should give as full information as possible about the organic compounds that they have analysed.

AC1.2. Some candidates struggled at showing the structure with all the carbon and hydrogen atoms displayed. A few consequently made errors in the molecular formula.

Task 2

AC1.4. Please note that band 2 and 3 require candidates to write balanced ionic equations as well as full symbol equations.

Activity 3 – Contamination in the Niger Delta region

Task 1

This task does not need to be word processed but candidates should use Excel to plot the graph and use it to draw a trend line through the origin for the data.

Task 2

The model assessment reads 'Write a technical report, using a word processor ...' This can be amended so candidates are not required to use a Word-processor. If this is the case, I would still like to see the calibration graph (see Task 1) generated using Excel, or similar package. This way in Activity 1 they will have a hand-written graph and in Activity 3 they will have generated one using Excel.

AC2.2. Candidates simply need to apply their understanding of how chromatography separates components to HPLC. They do not need to describe the other forms of chromatography in this case.

AC2.3. This is possibly the most difficult AC for candidates to do. Please do not be alarmed if they struggle with it and mark it in accordance with the band descriptors. Candidates in other centres struggle with it too. Awarding takes into account the challenge of the assessment as a whole.

AC5.4. It is very difficult to get to the top of band 3 and I would not expect to see many candidates scoring 8/9 and very few 9/9.

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UNIT 4: SCIENTIFIC PRINCIPLES AND THE ENVIRONMENT

General Comments

The quality of answers was generally better than in previous series, however basic recall was often poor.

An improvement was seen in the quality of calculations.

Candidates had good knowledge of food chains affecting populations, drawing conclusions from data and greenhouse gases.

Improvements are required in understanding of the greenhouse effect, temperature inversion and reducing environments.

Centres are also reminded that although the unit has its own content, any content from units 1,2 and 3 can also be assessed here.

Section A – Pre-release

Questions 1-4: Facility factor 45.0, attempt rate 100%

The pre-release article is available 1 month before the examination. Questions are based on content directly drawn from the article and from associated areas of the specification. Some centres had prepared their candidates well for this section. However other centres had not spent time discussing the pre-release or how it was linked to other areas of the specification.

1(a)(i): The vast majority of candidates achieved this mark.

1(a)(ii): Most candidates could suggest a valid answer here.

1(a)(iii): A wide variety of correct answers were seen here.

1(b): This question was answered well, using good scientific vocabulary.

1(c): Candidates performed well in this question.

2(a)(i): Almost all candidates could calculate N , but many could not find $\sum n(n - 1)$.

2(a)(ii): The main error here was incorrectly substituting in the value for $\sum n(n - 1)$. The majority of candidates could calculate $N(N-1)$.

2(b)(i): Many candidates discussed the limitations of a survey in general rather than in the context of viewing birds.

2(b)(ii): Candidates were often not specific enough here, “not disturbing the birds” was a common answer.

3(a): Few candidates gave the correct answer and many could not state the units in an acceptable format.

3(b): Many candidates could calculate the energy of 18 dB but then did not convert their answer to minutes.

3(c): This question was poorly answered and often left blank.

4(a): Often candidates copied out a sentence from the resource folder here instead of selecting the relevant points to answer the question.

4(b): Most candidates achieved at least one mark here, though some restated the same point rather than using different ideas which limited their score.

Section B

Question 5: Facility factor 39.0, attempt rate 100%

5(a): This question was well answered.

5(b): Candidates regularly discussed the ozone layer here and showed very little understanding of why the Earth's temperature increases.

5(c): Most candidates could plot the graph correctly, though some lines were questionable.

5(d): This question was poorly answered with many candidates unable to give a reason to support their opinion.

Question 6: Facility factor 17.3, attempt rate 98.0%

This question was the one that candidates found most challenging in section B.

6(a)(i): Many candidates did not see the need for precision here and chose an indicator.

6(a)(ii): Very few candidates achieved any marks here and many tried to use the pH equation.

6(b)(i): Candidates could not define a reducing environment and many discussed habitat loss.

6(b)(ii): Most candidates achieved some credit here but recall of this topic was poor. Some candidates confused this with photosynthesis.

6(b)(iii): The majority of candidates gained at least one mark here.

Question 7: Facility factor 17.6, attempt rate 98.0%

7(a): This question was poorly answered with many candidates either neglecting to mention ATP or confusing their definition with osmosis or diffusion.

7(b): Elucidation of oxidation numbers was generally poor but some candidates could correctly identify the elements involved and their part in the reaction.

7(c)(i): Many candidates could recall this answer.

7(c)(ii): Where attempted this question was well answered. Some candidates gave an answer relating to denitrification.

Question 8: Facility factor 44.9, attempt rate 100%

This was the most accessible question in section B

8(a)(i): Most candidates achieved this mark.

8(a)(ii): This question was well answered.

8(a)(iii): Where a reason was given, most candidates gained credit here.

8(a)(iv): The main error here was to discuss light absorption rather than heat.

8(b)(i): Most candidates could apply the formula here but many struggled with the standard form and significant figures.

8(b)(ii): This question was poorly answered with many candidates' answers talking about the "difference" or "time".

8(b)(iii): Many candidates referred to heat reducing the efficiency of the panel, rather than giving an answer relating to light.

8(c): Most candidates gave a correct answer here, though some incorrectly focussed on other methods of generating electricity.

Question 9: Facility factor 19.4, attempt rate 100%

9(a)(i): Few candidates could name a chelating agent.

9(a)(ii): This question was poorly answered.

9(a)(iii): Most candidates gained some credit here.

9(b)(i): Some candidates could recall this reaction, though many gave answers that would be correct for Fe^{2+} , Fe^{3+} or Cu^{2+} .

9(b)(ii): Candidates generally gained credit here where they had answered 9(b)(i) correctly.

9(c): Recall here was poor, often very vague statements were given.

9(d)(i): Most candidates could not identify the phenols.

9(d)(ii): This question was poorly answered. Many candidates showed a lack of understanding of skeletal structures.

Question 10: Facility factor 16.9, attempt rate 96.0%

10(a)(i): Answers showed no knowledge of a temperature inversion. Many confused this with climate change.

10(a)(ii): Candidates struggled to gain more than one mark here, with many failing to discuss both fuels.

10(b): This question was well attempted though few candidates found similarities between the two projects and many answers related to nuclear disasters. Some candidates wasted time and space repeating information they had given to answer 10(a)(ii), for which there was no credit here.

10(c): Most candidates gained some credit here, though some confused neutrons with electrons.



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