EXAMINERS' REPORTS

LEVEL 3 DIPLOMA IN ENVIRONMENTAL SCIENCE

SUMMER 2016

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ENVIRONMENTAL SCIENCE

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UNIT 1 - MANAGING ENERGY FOR A SUSTAINABLE FUTURE

General Comments

One centre submitted work for this unit in summer 2016. The quality of work submitted by the centre was good and assessment by the centre was realistic.

Administrative work was correctly submitted, with authentication sheets signed by the candidates.

Centres should note that when awarding mean marks from 2 activities for an AC, any half marks should be rounded up.

Activity 1

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

Task 1

AC4.1: To achieve top band marks for the plan it must include a time-line or chart to show how the candidates are going to complete the activity in the time provided. They need to identify what data they need to collect in order to calculate the efficiency of the energy generator.

For each generator, candidates need to plan to produce a comparison of the calculated quantities.

Task 2

AC4.2: This AC was generally well done.

AC4.3: To achieve top band marks, candidates need to record suitable data to calculate comparable outcomes (e.g. efficiencies), and sufficient data to allow for repeatability and reduction of random errors. There is also a need to signify the precision of the instruments used (e.g. in the apparatus list the meter rule has a precision of ± 0.1 mm).

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.

AC4.6: Candidates produced very good graphs and Sankey diagrams for one of the devices. To achieve top band marks here the candidates must produce good graphs and Sankey diagrams for both devices.

AC4.7: In general, the evidence for this AC was not detailed enough. Comments should include suggestions for improvement of the procedure, validity and accuracy of data, and sources of possible errors.

AC5.1: This AC was generally well done.

AC5.2: Candidates tended to produce excellent work for one practical activity, but little evidence for the second practical activity. Therefore the mark awarded was a 'best fit'.

Task 4

AC2.1: Candidates generally achieved the bottom band for this AC. To achieve the higher bands, 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: Again, candidates generally achieved the bottom band for this AC. Candidates need to form a coherent explanation of how electricity is generated in both of their systems.

AC3.2: Once more, candidates generally achieved the bottom band for this AC. There needs to be an understanding of energy losses for lower band marks. For middle and top bands, the candidates need to explain how these losses have, or will be reduced.

AC5.3: This AC was generally well done. However, a Sankey diagram must be produced for both devices.

AC5.4: This AC was not attempted by candidates.

AC5.5: For this AC candidates need to produce a structured report. Please note that lack of an outcome does not prevent candidates from scoring in this AC as credit is also given for using appropriate language, punctuation and grammar.

Activity 2

The majority of the marks available for this activity were allocated to the writing of the report in task 3. This was done poorly by all candidates.

This is a demanding activity that requires candidates to carry out many calculations including the following:

- finding the area of rooms, roofs and windows,
- using U-values
- using R-values

Candidates need to ensure that these calculations are carried out in order to be used effectively in task 3.

Task 1

AC3.1: To achieve the top band marks for this criterion, candidates should state what analysis they are going to do. There should be reference to construction of the building, insulating materials, calculation of current energy use and improvements.

AC4.1: A strategy for carrying out the audit should be given, along with a time line or chart to explain how much time they plan to spend on task 2 and 3. Candidates should produce a table and/or proforma to show the information they need to collect in order to perform the audit.

Task 2

AC4.5: To achieve top band marks, candidates need to show they have calculated areas, performed calculations involving R- and U-values, and pay-back times for the solar panels.

AC4.6: Candidates need to plot a relevant chart, e.g. heat lost per room from their calculations or effect of depth of insulation on heat lost etc.

AC4.7: For this AC, candidates should include details of how they could improve the processing of their data (e.g. by use of a spreadsheet).

AC5.1: For this criterion all candidates drew tables, but few of their tables showed relevant information extracted from the task and calculated data. When secondary data is the only information given, candidates are limited to bottom band marks.

AC5.2: This criterion was generally well done.

Task 3

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

- Renewable sources
- Non-polluting sources
- Methods to reduce reliance on fossil fuels (e.g. insulation)

AC1.2: Candidates should discuss the following drivers of sustainable energy:

- Government policy (e.g. insulation grans, energy security)
- Reduction of pollution / CO_2
- Conservation of fossil fuels to meet future energy needs
- Inter-government protocols (e.g. Kyoto)

AC2.2: For this criterion candidates should explain the process of heat transfer through the walls, ceilings, and insulation materials in terms of conduction, convection and radiation.

AC2.3: The working of solar panel needs to be explained in detail to obtain top band marks for this criterion.

AC3.2: For this AC, candidates need to explain how energy is lost from the building as a whole. They need to identify and explain where, and by what methods heat is lost from the building.

AC3.3: For this AC there must be an explanation based of the candidates' calculations as to why they are going to recommend the types of insulation.

AC5.3: Sankey diagrams showing energy loss from rooms, the whole building, or for solar panels should be constructed here.

AC5.4: Recommendations should be based on evidence and calculations to achieve the top band for this AC.

AC5.5: For this AC candidates need to produce a structured report. Please note that lack of an outcome does not prevent candidates from scoring in this AC as credit is also given for using appropriate language, punctuation and grammar.

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UNIT 2 - THE LIVING ENVIRONMENT AND CONSERVATION

General Comments

One centre submitted work for this unit in summer 2016. Administrative work was correctly submitted, with authentication sheets signed by the candidates.

Activity One

Task 1

AC4.1 (plan 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 completed well, but candidates require clearer planning of timescales.

AC4.2 (risk assessment) was completed well where candidates were clear about the precautions that needed to be taken.

Task 2

AC4.3 (obtaining data) and AC4.4 (recording data) were achieved through tally charts with clear labelling. Allowance was given for candidate comments relating to time constraints, although data conflict with plans in task 1.

Task 3

AC1.4 (explain how factors affect ecosystem populations) should link to the factors investigated in task 2 (pH, moisture levels, temperature), but this was not evident.

AC2.1 (describe…) and AC2.2 (explain how human activity affects ecosystems) generally consisted of good descriptions, but the explanations did not clearly state how humans have directly or indirectly impacted upon the individual organisms within the ecosystem. Band 3 (6-9 marks) for AC2.2 requires 'detailed reasoning'.

AC4.5 requires processing of data, i.e. through the use of Chi-squared, t-test or Simpson's Index; production of a graph limits the candidate to band 1 (1-2/6).

AC4.6 requires candidates to comment upon the comparisons observed between the two locations sampled, with detailed references to the main causative factors.

AC4.7 was completed to a higher standard than AC4.6 and generally related to comments linked to the graph and raw data. Band 3 (5-6) required links to the method of data processing, but this was not evident.

Task 4

AC1.1 required candidates to give a more detailed description for band 2 (3/3); this was not evident.

AC1.2 and AC1.3: candidates were able to access band 2 (3-4) but failed to link the key concepts to the sampled ecosystem which would have moved them to band 3.

Activity Two

Task 1

AC1.7: Candidates were able to explain the process of succession.

Task 2

AC1.5: using the data provided, candidates were able to create graphs and analyse the patterns observed.

AC1.4: candidates were able to identify and explain how a range of factors (biotic and abiotic) affected ecosystem populations. In this section candidates should not focus solely upon human impact.

Task 3

AC1.6 required candidates to link the annual percentage cover data to the adaptation of *Porites lobate*, linking this to the process of evolution. Candidates were able to link adaptation to evolution but must make clearer links to the species provided.

Task 4

AC2.2 required candidates to explain the impact of failure to conserve the reef system and AC4.6 (assess how human activity affects an ecosystem) required candidates to use data to show how species have recovered from the incident at year 8; this was not evident in the reports.

AC3.1: candidates need to be more explicit to demonstrate this AC (describe what is meant by conservation).

AC3.2: there was basic evidence of this AC (explain why conservation is necessary).

AC3.3 (conservation methods) was completed well.

AC3.4: candidates could not provide detailed reasoning of the process of extinction, linked to the ecosystem studied.

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UNIT 3 - MONITORING OUR PHYSICAL ENVIRONMENT

General Comments

This is the first year that the qualification has been available and there was one centre who submitted portfolios for moderation. The quality of the work submitted and the assessment by the centre was very good. The work was well annotated, which is key to a successful moderation outcome and the assessors showed a very good understanding of the assessment procedures.

To support this unit, there are several booklets that can be used in the laboratory that will prepare candidates for their final task, which is the model assessment. This 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), 2 (principles of environmental analysis), 4 (process analytical data) and 5 (report on investigations). Again 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. It was felt that the graphs were sometimes awarded too many marks as they weren't well annotated and lines of best fit weren't very good on some of them.

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 were able to show their understanding of functional groups and give the names and structures of compounds. It was felt that AC1.1 was assessed rather generously some candidates who failed to show understanding of functional groups.

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.

The technical reports written by candidates were of very good quality.

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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

Candidates had not thoroughly studied the pre-release and could not expand beyond the content of the article. The pre-release article was available for four weeks before the examination to allow preparation in advance. Questions were based both directly on the content of the article and wider knowledge taken from the specification.

Q1(a). Candidates were required to recall two photosynthetic pigments. Half of the candidates were able to do this correctly.

Q1(b). This question was poorly answered by all candidates. Carboxylase is not a sufficient answer to this question.

Q1(c). Most candidates answered CO_2 correctly, some candidates gave temperature. The majority of candidates did not get both answers.

Q1(d). The majority of candidates answered this question correctly and could name the two other components of ATP. Triose was not accepted in place of ribose.

Q2(a). The majority of candidates gave an answer within the acceptable range of 11.5-15 psu, rather than stating this range.

Q2(b). This question was answered poorly. No candidate was able to calculate the rate of cell production or even use the graph to identify the necessary data.

Q2(c). Many candidates did not give sufficient detail to be awarded the mark.

Q2(d)(i). This question was answered poorly. The majority of candidates give a single suggestion when two separate marks were available.

Q2(d)(ii). Again, this question was poorly answered by the majority of candidates. Oxygen running out was credited as a correct answer.

Q3(a). No candidate achieved 3 marks for this question. There was confusion about whether oxygen was being taken in or given out during photosynthesis and respiration.

Q3(b)(i). Many candidates scored one mark in this question. However, most of these candidates gave the converse of the first marking point as the second part of the answer.

Q3(b)(ii). Many candidates did not attempt this question, and their achievement in 3(b)(i) limited their responses to this part.

Q4(a). There were poor responses to this question, relating to negativity of numbers rather than magnitude requiring a logarithmic scale.

Q4(b). No candidates related their answer to equilibria.

Q4(c). Some candidates identified 'low energy' rather than 'high energy' factors.

Section B

Section B is based on the wider specification content.

Q5(a). The majority of candidates could calculate the numbers of protons and neutrons.

Q5(b). The majority of candidates did not show how they calculated their answer using the graph but still achieved 2 marks for the correct answer.

Q5(c). Candidates could not recall the required isotope.

Q5(d). Answers were vague and did not refer to nuclei.

Q5(e)(i). Most did not refer to increasing concentration but were able to offer a simple explanation of bioaccumulation.

Q5(e)(ii). Half of the candidates were able to answer this question correctly.

Q5(f)(i). All candidates could provide a reason for their choice, however the selected source was often incorrect.

Q5(f)(ii). Half of the candidates were able to answer this question correctly. This was one of the best-answered questions on the paper.

Q6(a)(i). This question was poorly answered. Most candidates believed that Carbon was taken up by the roots. There was little or no reference to the Carbon Cycle and some even related their answer to the Nitrogen Cycle.

Q6(a)(ii). Some candidates were able to answer this question correctly. However, they did not mention the processes related to Carbon neutrality.

Q6(a)(iii). Some candidates were able to balance the equation, but none used the *n.*

Q6(b)(i). Half of the candidates recognised that energy is required to make bricks/concrete. No candidates achieved a second mark.

Q6(b)(ii). Most candidates did not attempt this question.

Q6(b)(iii). The majority recognised that the thickness of the wall was a factor.

Q6(b)(iv). Most candidates could not construct a coherent response. Some recognised that the straw wall was thicker and that convection currents can occur in the cavity.

Q7(a). Candidates did not understand that pH is a logarithmic scale.

Q7(b). Half of the candidates could calculate the moles of nitrogen atoms present.

Q7(c). Half of the candidates made correct reference to a specific variable. Some referred to the non-uniform environment. 'Fair' is not a credit-worthy answer.

Q7(d). Candidates could not recall this method. Several references were made to universal indicator/litmus rather than more accurate techniques.

Q7(e). Candidates were confused about acidity and pH. They generally did not refer to the table.

Q7(f). No candidates answered this question correctly. No candidate was able to recall the formula of a hydrogen ion.

Q7(g)(i). No candidates were able to define a free radical.

Q7(g)(ii). Candidates were unaware of the concept of a radical chain reaction.

Q7(g)(iii). Candidates were similarly unaware of the termination of a radical chain reaction.

Q7(h). This question was poorly answered. A minority could identify the availability of nitrogen for plant growth.

Q8(a). No candidate could answer this question.

Q8(b). No candidate could answer this question. There was also confusion relating surface area to particle size.

Q8(c). Half of the candidates could correctly state that temperature or pH would influence the adsorption of a chemical by soil.

Q9(a)(i). Chelation was poorly defined. The majority of candidates could not answer this question.

Q9(a)(ii). Most candidates did not attempt this question.

Q9(b). No candidate could identify the wavelength or give an explanation.

Q9(c)(i). The majority of candidates could plot the graph and draw a line of best fit. Some candidates inverted the axes.

Q9(c)(ii). Most candidates could identify the concentration from the graph, but failed to calculate the original concentration.

Q9(d). No candidate could link acid rain to leaching.

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