National
Qualifications
2023

2023 Environmental Science

Higher – Paper 1

Finalised Marking Instructions

These marking instructions have been prepared by examination teams for use by SQA appointed markers when marking external course assessments.

General marking principles for Environmental Science Higher

Always apply these general principles. Use them in conjunction with the detailed marking instructions, which identify the key features required in candidates' responses.

(a) Always use positive marking. This means candidates accumulate marks for the demonstration of relevant skills, knowledge and understanding; marks are not deducted for errors or omissions.

(b) If a candidate response does not seem to be covered by either the principles or detailed marking instructions, and you are uncertain how to assess it, you should seek guidance from your team leader.

(c) Where a candidate makes an error at an early stage in a multi-stage calculation, award marks for correct follow-on working in subsequent stages. Do not award marks if the error significantly reduces the complexity of the remaining stages. Apply the same principle in questions that require several stages of non-mathematical reasoning.

(d) Award full marks for a correct final answer (including units if required) on its own with no working shown.

(e) Candidates may access larger mark allocations fully, whether they respond in continuous prose, linked statements, or a series of discrete developed points.

(f) In the detailed marking instructions, if a word is **underlined** then it is essential; if a word is **(bracketed)** then it is not essential.

(g) In the detailed marking instructions, words separated by / are alternatives.

(h) Do not award marks if a candidate gives two answers, where one is correct and the other is incorrect.

(i) Where the candidate is instructed to choose one question to answer but instead answers both questions, mark both responses and award the better mark.

(j) Award marks for a valid response, even if the response is not presented in the format expected. For example, award the mark if the response is correct but is not presented in the table as requested, or if it is circled rather than underlined as requested.

(k) Candidates may use abbreviations (for example, BOD or GPP) or chemical formulae (for example, CO_2 or H_2O) as acceptable alternatives to naming, unless required by the question, but these must be correct. For instance, chemical formulae with an incorrect subscript or superscript component (for example CO^2), or full-size number (for example CO2) should not be awarded the mark.

(l) Award marks, up to the maximum mark allocation for the question, for content that is outwith the course specification but used appropriately at the correct level for Higher.

(m) If candidates are required to give a numerical answer, and units are not given in the stem of the question or the answer space, they must supply the units to gain the mark.

(n) If incorrect **spelling** is used:

- and the term is recognisable, then award the mark;
- and the term can easily be confused with another scientific term, then do not award the mark, for example bioaccumulation and biomagnification, or qualitative and quantitative;
- and the term is a mixture of other terms, then do not award the mark.

(o) When presenting data:

- for marking purposes no distinction is made between bar charts (used to show discontinuous features, have descriptions on the x-axis and have separate columns) and histograms (used to show continuous features, have ranges of numbers on the x-axis and have contiguous columns)
- other than in the case of bar charts/histograms, if the question asks for a particular type of graph or chart and the wrong type is given, then do not award the plotting mark. Marks may still be awarded for other required components, as specified in the detailed marking instructions.
- do not award the relevant mark if the graph too small to check the accuracy of plotting; or if 0 is plotted when no data for this is given (ie candidates should only plot the data given)

(p) Award marks only for a valid response to the question asked. For example, in response to questions that ask candidates to:

- **identify**, **name**, **give**, or **state**, they need only name or present in brief form;
- **define,** they should give a statement of the definition;
- **calculate**, they must determine a number from given facts, figures, or information;
- **compare**, they must demonstrate knowledge and understanding of the similarities and/or differences between things;
- **describe**, they must provide a statement or structure of characteristics and/or features;
- **evaluate**, they must make a judgement based on criteria;
- **explain**, they must relate cause and effect and/or make relationships between things clear;
- **justify**, they must give reasons to support their suggestions or conclusions;
- **discuss**, they must write about a topic in detail, taking into account different issues or ideas;
- **outline**, they must provide a brief sketch of content – more than naming but not a detailed description;
- **predict**, they must suggest what may happen based on available information;
- **suggest**, they must apply their knowledge and understanding of Environmental Science to a new situation. A number of responses are acceptable: marks will be awarded for any suggestions that are supported by knowledge and understanding of Environmental Science.

Note that this list is not exhaustive.

Marking instructions for each question

Question			Expected response	Max mark	Additional guidance
1.	(a)	(i)	(Legislation is required in order) to achieve the aims of government strategy/policy.	**1**	Accept responses in the context of decommissioning.
		(ii)	Marine Scotland	**1**	Accept: MS Do not accept: Marine Scot
		(iii)	(To protect the environment by) identifying all possible significant environmental effects of a proposed development. **AND** Mitigation of negative effects.	**1**	Not just to protect the environment. Response must refer to environmental impacts **AND** mitigation.
		(iv)	Boat-based surveys were carried out over two days each month whereas the aerial survey was used over one day. **OR** Weather conditions were different when the surveys were carried out (and may affect the presence/ absence of birds) **OR** Different vantage points from boats and aerial surveys. Or other valid response.	**1**	Response must refer to lack of or inability to control specific variables. Do not accept: two different methods used.
	(b)	(i)	Conservation designation which aims to protect (nationally important) marine wildlife, habitats, geology, and undersea landforms.	**1**	Must infer marine. Response must refer to at least two protected examples (eg wildlife and habitats)
		(ii)	Commercial fishermen could be prevented from accessing traditional fishing grounds, which would impact on their livelihood. **OR** Renewable energy company might find an ideal site/wind resource for offshore wind turbines but be unable to locate them there. **OR** Multiple marine environment users could become concentrated in a smaller unprotected site, increasing conflict between user groups. Or other valid response.	**1**	Response could relate to commercial fishermen, cruise liners, recreational sailors, wildlife cruise operators, renewable energy companies, oil and gas platform decommissioning yard, ferries, or other valid user(s) of the marine environment. Note: an MPA designation does not close off access to the area, only limits activities/practices.

Question			Expected response	Max mark	Additional guidance
2.	(a)		A ranking of management options based on what is best for the environment.	**1**	Response must refer to the environment.
	(b)		49 097 tonnes	**2**	(39 408 × 0.8117) + (30 850 × 0.5546) = 49 096.88 Accept: 49 096.9 1 mark for correct calculation of both masses. Unit required. Allow for error carried forward between stages.
3.			Release of (residual) oil/toxic materials into the environment **(1 mark)** affects water quality in the surrounding area/contaminates fish/results in bioaccumulation/ destroys some habitats **(1 mark)** Or other valid response.	**2**	Response must relate to disturbance of drill cuttings.
4.			Monitoring will assess changes (positive and/or negative) in the quality of the environment over time. **OR** To determine whether the populations of protected species (eg dolphins) are increasing/decreasing in the area. **OR** To assess changes in the concentration of toxic compounds in the water and target appropriate action. Or other valid response.	**1**	Response must refer to changes over time. Accept valid reference to positive or a negative impact of decommissioning.

Question			Expected response	Max mark	Additional guidance
5.	(a)		-5.29 (%)	**2**	2014: 1 222 466 ÷ 542.6 = 2252.98 2015: 893 889 ÷ 418.9 = 2133.90 **(1 mark)** $\left(\frac{(2252.98-2133.90)}{2252.98}\right)\times 100$ Accept -5.3 or -5.285 Response must indicate decrease. If % decrease on raw data for values correctly calculated ie -26.9%, then award 1 mark. If arithmetical error in price per tonne, but subsequent % decrease is correct, then award 1 mark. If % decrease on raw data for mass, then award 0 marks.
	(b)		They limit the overexploitation of resources/reduce impacts on habitats, species and biodiversity/ any other valid response.	**1**	

Question			Expected response	Max mark	Additional guidance
6.			**Explosive** • Requires fewer personnel (than mechanical) so will have lower costs. • Structure can be raised to the surface as a single piece, so will be faster/cheaper (than using mechanical cutting) • Is lower cost and faster than mechanical cutting, so less overall expense for the UK taxpayer. • Faster process so less disruption to the environment. • Other water use can take place quicker due to explosive method being faster (than mechanical) • Accept opposite arguments from mechanical (with appropriate justification) **Mechanical** • No shockwaves/acoustic energy (from use of explosives), which could kill or harm marine/ protected species present in the area. • No dredging of seabed required <u>if cut from the inside</u>, so will impact less on water quality/ seabed than explosives. • Less disturbance of drill cuttings <u>if cut from the inside</u>, therefore less pollution released. • As the process takes longer, other users are excluded from the area so less disturbance to wildlife populations. • Less impact on the food web from explosions and pollution • Accept opposite arguments from explosive (with appropriate justification) Or other valid response.	**5**	1 mark for each valid <u>expanded</u> point. Candidates may cite statements from the information provided, but these must then be discussed further. No marks awarded for just stating information provided. Candidates may gain full marks by putting forward legitimate arguments supporting explosives. **OR** Arguments supporting mechanical.

[END OF MARKING INSTRUCTIONS]