



National
Qualifications
2026

2026 Environmental Science

Higher - Paper 1

Question Paper Finalised Marking Instructions

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

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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, CO₂ or H₂O) 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 CO²), 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;
- **determine**, they must work out an answer through information provided or a calculation
- **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.			Kinetic (energy is converted) to heat (energy on impact).	1	Do not accept: movement or movement energy in place of kinetic energy Do not accept: heat on its own Must be the change in energy.
2.			(The rate of) photosynthesis will decrease as light intensity reduces, (1 mark) and primary productivity/biomass production will also decrease. (1 mark)	2	1 mark for impact of reduced light on photosynthesis. 1 mark for subsequent impact on productivity. Do not accept food in place productivity/biomass.
3.	(a)	(i)	47 520 tonnes	2	$400 \times 5.5 = 2200$ tonnes in 1 hour 90% of 2200 = 1980 tonnes (1 mark) 1980×24 hours = 47 520 tonnes Alternative working: $400 \times 5.5 \times 24 = 52\,800$ (tonnes) (1 mark) 90% of 52 800 = 47 520 (tonnes) Allow for correct follow through from first stage. (max of 1 mark) Must include unit.
		(ii)	Robot may not be working at maximum efficiency/robot may not be operating continuously over 24-hour period/concentration of nodules in target areas may be different to that estimated/other valid response.	1	
	(b)	(i)	Environmental impact assessment/EIA	1	Accept analysis in place of assessment.
		(ii)	Identification of measures to avoid/minimise/remedy impacts.	1	
		(iii)	A high number of species was present (in the survey area), (1 mark) but the number of individuals of each species present (in the survey area) was low. (1 mark)	2	

Question			Expected response	Max mark	Additional guidance
3.	(b)	(iv)	Finer sediments may suffocate/smother marine organisms. Or other valid response.	1	Accept reference to visual interference. Accept reference to bioaccumulation of potentially harmful/toxic substances in the sediment.
		(v)	Removal of large quantities of seafloor sediment will affect species that others rely on, (1 mark) causing food web/trophic issues. (1 mark) OR The robot collector/shipping/collection process will generate noise, (1 mark) which will disturb species that use vibration to find mates/catch prey/evade capture or disrupt communication/navigation by species that use underwater sound. (1 mark) Or other valid response.	2	Must relate an output from the nodule collection process to an impact on organisms and/or their environment.
		(vi)	Increased recycling/more efficient land-mining practices/improve product design/other valid response.	1	Do not accept: recycling alone
4.			The abundance of cobalt is lower than that of copper and nickel. OR Cobalt supply relies on the market price of copper/nickel and companies won't mine these if the global price of copper/nickel is low. Or other valid response.	1	Do not accept statement lifted straight from the supplementary booklet; must be an explanation of the difference in risk.

Question			Expected response	Max mark	Additional guidance
5.			Permit - the minerals are abundant on the crust/on the CCZ seafloor, (1 mark) so nodule collection will be a long-term project, (1 mark) with named economic/social benefits (max 1 mark) - the minerals are needed by the renewables sector to help meet net-zero targets, (1 mark) and minimise climate change (1 mark) - demand for clean energy technologies is predicted to increase significantly over the coming decades, (1 mark) named example eg electric vehicle, (max 1 mark) but recycling rates for manganese/nickel are low (1 mark) - damage to the environment will be minimised under the ISA regulations. (1 mark) Or other valid response.	5	Candidates may cite statements from the information provided, but these must then be discussed further. No marks awarded for simply stating information provided. Discussion may offer counter-arguments for either option but should conclude with which one of the options should be adopted. Do not accept points that are relevant for both options.

Question			Expected response	Max mark	Additional guidance
5. (continued)					
			Do not permit: - coastal countries could exploit resources within their own EEZ and leave those in international waters untouched (1 mark) - ISA aims to protect the marine environment, and mining will always have adverse environmental impacts. (1 mark) - the minerals (manganese/nickel/copper/cobalt) are already mined onshore, (1 mark) and supply risk is moderate for cobalt and very low for manganese, nickel, and copper (1 mark) - the minerals could all be recycled, (1 mark) instead of exploiting new/remaining deposits (1 mark) - nodule formation is extremely slow, so is a non-renewable resource (1 mark) - little is known about the ecology of the deep-sea environment, (1 mark) mineral exploitation should not proceed until more scientific evidence is available (1 mark)		Max of 1 mark for a named impact without further expansion.

Question			Expected response	Max mark	Additional guidance
5. (continued)					
			- discharge of sediments into the photic zone/water column could affect light penetration,(1 mark) which would affect marine food webs (1 mark) - biodiversity in the aphotic zone/deep-sea/>1000 m is highly specialised/adapted to the conditions, (1 mark) and will be impacted by noise/vibration/sediment disturbance (1 mark) - transportation of nodules (to a shore-based processing unit) will release greenhouse gases that contribute to climate change (1 mark) - developed countries will benefit disproportionately as poorer countries will not be able to afford to mine (1 mark) Or other valid response.		

[END OF MARKING INSTRUCTIONS]