National
Qualifications
RESOURCE

2021 Environmental Science
Section 1

Higher

Finalised Marking Instructions

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 which require several stages of non-mathematical reasoning.

(d) Award full marks for a correct final answer (including units if required) on its own, unless a numerical question specifically requires evidence of working to be 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.

(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. Do not penalise candidates repeatedly if units are required on more than one occasion.

(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 give the mark(s) for this. Where provided, marks may still be awarded for correctly labelling the axes, plotting the points, joining the points either with straight lines or curves (best fit rarely used), etc.
- do not award the relevant mark if the graph uses less than 50% of the axes; if the x and y data are transposed; 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;
- **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.

Marking instructions for each question

Question			Expected response	Max Mark	Additional Guidance
1.	(a)		Between 1884 and 2019 there is an increase in years with above average temperature, (and a decrease in years with below average temperature). (**1 mark**) Before the mid-1980s most years were below average, after that most years were above average. (**1 mark**) Or other valid response.	**2**	1 mark for the overall trend. 1 mark for identifying the point it changes. The average yearly temperature has increased from 1884 to 2019. Award 1 mark.
	(b)		Increased intensity/frequency of storms could increase cloudiness/ turbidity of water. **OR** Higher water temperature will reduce the dissolved oxygen content. **OR** Seawater incursion (through overtopping or breaching shingle banks) could contaminate groundwater reservoirs. **OR** Flooding by seawater during intense storms would make the drinking water unusable (for a short time). Or other valid response.	**1**	Any one

Question			Expected response	Max Mark	Additional Guidance
2.	(a)		A (symbiotic) relationship where a species is dependent on a host species, but the host species can survive on its own.	**1**	Response must refer to dependency of one species on the other, but independence of the host.
	(b)		Does not feed.	**1**	In glossary, *trophic* relates to feeding and nutrition. Do not accept: 'does not get eaten/predated' on its own.
3.	(a)	(i)	Forestry and Land Scotland	**1**	Do not accept Forestry Commission Scotland as all centres should now be using the new agency name in their teaching.
		(ii)	The shingle complex must be protected under the SSSI management requirements. **OR** To maintain the extent of open shingle. **OR** To slow the rate of succession onto the shingle. **OR** Gorse may outcompete plant communities listed in the SSSI designation. Or other valid response.	**1**	Gorse removal aims to maintain the integrity of the shingle complex. Succession would change its character.
	(b)	(i)	To characterise and assess the quality of an environment over time.	**1**	Response must refer to changes over time.

Question			Expected response	Max Mark	Additional Guidance
3.	(b)	(ii)	**Electrical conductivity meter**: Insert probe into sample. Adjust meter for temperature. Read the display. **(Glass) hydrometer**: Measure temperature of the sample. Lower hydrometer into sample and read the (specific gravity) measurement off the scale on the hydrometer. (Based on the temperature of the sample) convert the (specific gravity) measurement to a salinity value. **Refractometer:** Add a sample of groundwater into the refractometer. Read the salinity measurement off the scale inside the refractometer. Or other valid response.	**2**	1 mark for name of equipment used. 1 mark for valid description of its use.
4.	(a)		£1·52 million	**2**	£100 = £196 so £1 = £1·96 (**1 mark**) (½ box tolerance – accept 1·94 to 1·98) £776,554 × 1·96 = £1,522,045·84 = £1·52 million (**1 mark**) Accept £1·5 million or £1·522 million.
	(b)		£18,340,695	**2**	5·52 million ÷ 31 = £178,065 (**1 mark**) £178,065 × 103 = £18,340,695 (**1 mark**) Accept £18,340,645 (if candidate has used unrounded intermediate value)
	(c)		Environmental Impact Assessment/ EIA	**1**	Do not accept: impact assessment or Strategic Environmental Assessment/SEA.

Question			Expected response	Max Mark	Additional Guidance
5.			**Hard engineering** • An offshore breakwater is the cheapest hard engineering approach and compares well with the cost of soft engineering. (**1 mark**) • An offshore breakwater would be a one-off construction/would require minimal maintenance, so would be cost-effective in the longer term. (**1 mark**) • An offshore breakwater would strengthen shingle defences, so would provide added protection to Settlement X. (**1 mark**) • Rock armour breaks and absorbs wave energy, so waves would be less likely to erode the shingle bank. (**1 mark**) • Rock groynes trap shingle, so would rebuild the bank and reduce further erosion. (**1 mark**) • Beach nourishment involves movement of shingle, which will impact on shingle-based species and the area's geomorphology, so could threaten SSSI status. (**1 mark**)	**5**	1 mark for each valid <u>expanded</u> point that relates to the selected option. Candidates may cite statements from the evidence provided, but these must then be discussed further. No marks for stating information provided. Discussion may offer counter-arguments for the other option but should conclude with why the nominated option should be adopted.

Question			Expected response	Max Mark	Additional Guidance
5.			**(continued)** • Managed retreat/emergency work only could see the abandonment of Settlement X, which will have significant social and economic impacts in the area. (**1 mark**) • Managed retreat could result in contamination of groundwater supplies, threatening livelihood of local communities/industries reliant on it. (**1 mark**) • Soft engineering approaches will require constant monitoring and action, whereas hard engineering approaches have a longer lifespan and need less monitoring/maintenance. (**1 mark**) • Soft engineering approaches are costed over 50 years, so will be ongoing and could end up costing significantly more. (**1 mark**) • Soft engineering approaches could prove ineffective as storm events increase in frequency and intensity/sea level rises/river flow rate and volume increases. (**1 mark**) Or other valid response.		

Question			Expected response	Max Mark	Additional Guidance
5.			**(continued)** **Soft engineering** • Soft engineering approaches are more sustainable (than hard engineering approaches) as they allow natural processes to continue. (**1 mark**) • The river and estuary are designated as SSSIs because they are exceptional sites for geology/wildlife, and soft engineering will maintain their natural look. (**1 mark**) • Offshore breakwater/rock groyne requires extensive below-water construction, which will disturb the sea bed and species living in or on it. (**1 mark**) • Offshore breakwater could act as a barrier for migrating anadromous species/salmon/ sea lamprey, reducing their spawning potential/migration/ survival. (**1 mark**) • Rock armour/rock groynes/hard engineering approaches have a visual impact that could deter visiting wildlife enthusiasts. (**1 mark**) • Rock groynes disrupt natural coastal processes/enhance erosion further along the coast, so shift the problem elsewhere. (**1 mark** • Managed retreat does not require any construction work, so will not disturb species/ habitats. (**1 mark**)		

Question			Expected response	Max Mark	Additional Guidance
5.			**(continued)** • Managed retreat encourages development of saltmarsh, so will provide a new (coastal) habitat. (**1 mark**) • Emergency work only makes financial sense as engineering is expensive and might prove ineffective. (**1 mark**) Or other valid response.		

[END OF MARKING INSTRUCTIONS]

The following table provides information on each question including: Course content being assessed; Skills assessed (see Environmental Science Understanding Standards materials for a definition of each code); Maximum mark; A-type marks.

Question		Course content - Topic & key area	Skills assessed	Maximum mark	A-type marks
1	(a)	Sustainability - skill	S6	2	1
	(b)	Sustainability - Anthropogenic climate change	K3	1	
2	(a)	Living Environment - Interdependence	K1	1	
	(b)	Living Environment - Interdependence	K3	1	1
3	(a)(i)	Living Environment - Human influences on biodiversity	K3	1	
	(a)(ii)	Living Environment - Human influences on biodiversity	K3	1	
	(b)(i)	Living Environment - Human influences on biodiversity	K1	1	
	(b)(ii)	Living Environment - Investigating ecosystems and biodiversity	S1	2	1
4	(a)	Sustainability - skill	S4	2	
	(b)	Sustainability - skill	S4	2	
	(c)	Living Environment - Human influences on biodiversity	K1	1	
5		Living Environment, Earth's Resources, Sustainability	S6	5	3

This paper has not been used as a live examination and the questions are therefore untested. Questions labelled with A-type marks are those predicted to perform as A-grade.
The marking instructions have not been standardised based on candidate responses and you may therefore need to agree within your centre how to consistently mark an item if a candidate response is not covered by the marking instructions.

The examination is normally balanced across paper 1 and paper 2.