



National
Qualifications
2022

2022 Environmental Science
Higher - Paper 1
Finalised Marking Instructions

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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 which require several stages of non-mathematical reasoning.
- (d) Award full marks for a correct final answer (including units if required) on its own.
- (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;
- **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;
- **outline**, they must provide a brief sketch of content - more than naming but not a detailed description;
- **discuss**, write about a topic in detail, taking into account different issues or ideas.
- **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)	Methane/carbon dioxide	1	Named gas must be linked directly to landfill emissions and the enhanced greenhouse effect. Landfill gas is approx. 60% methane and 40% carbon dioxide. Seepage of trace amounts of nitrogen, water vapour, sulfur and VOCs is not considered to contribute to the enhanced greenhouse effect.
		(ii)	It is generated from waste deposits already in place OR Its use offsets extraction or use of oil/coal/natural gas/fossil fuels Or other valid response.	1	Any one. Accept: burning of methane produces carbon dioxide, which is a less potent greenhouse gas
	(b)	(i)	change soil pH/may alter soil fertility/alter soil texture/alters water retention capacity of soil/ other valid response.	1	Any one. Do not accept: reference to iron/mud pan layers
		(ii)	A variety of habitats are present, offering shelter/protection OR Organic material from landfill/ sewage works could have provided a food/nutrient source OR Concrete/ash waste could change soil pH to one favourable to a wider variety of species OR As the site is not being used, there is little disturbance by humans Or other valid response.	1	Any one. Candidates must refer to the range or variety of habitats to access the first mark Do not accept: some organisms prefer high pollution levels/are pollution tolerant

Question		Expected response	Max mark	Additional guidance
2.		Option 1, retains the marshland which protects against increases in water level caused by storms and extreme high tides or other valid response	1	
3.	(a)	Stratified	1	The population was divided into age categories and a random sample collected from each category.
	(b)	£1,206,000	2	$40\,000 \times 0.59 = 23\,600$ $23\,600 \times 35 = \text{£}826,000$ (1 mark) Allow follow through from an incorrectly calculated adult revenue for $\text{£}826,000 + \text{£}380,000 = \text{£}1,206,000$ (1 mark) Unit required in final answer.
	(c)	16	2	$Q_1 = 28$ (mean of 27 and 29) $Q_3 = 44$ (mean of 42 and 46) (both Q values identified correctly, 1 mark) $44 - 28 = 16$ (1 mark) Allow follow through from an incorrectly identified Q_1 and Q_3 value
	(d)	Access roads must still be built therefore: construction will release greenhouse gases OR habitat will be destroyed/ fragmented OR removal of vegetation will result in soil erosion OR concreting over land will increase risk of flooding OR roadkill will increase Or other valid response.	2	1 mark for cause. 1 mark for effect. Accept: more people wanting to travel by bus will require more buses to be laid on, which will increase greenhouse gas emissions, or other valid bus-related responses

Question		Expected response	Max mark	Additional guidance
4.		<p>Increased activity/noise/water disturbance could disturb/injure/kill aquatic life/terrestrial life</p> <p>OR</p> <p>Dropping litter/construction materials or oil/fuel leaks into river could disturb/injure/kill aquatic life</p> <p>Or other valid response.</p>	2	<p>1 mark for cause. 1 mark for effect.</p> <p>Accept both positive and negative impacts.</p> <p>Response must relate to local impact and not global eg not impact on climate change</p>
5.		<p>Construction jobs will be temporary/terminated once development is complete</p> <p>OR</p> <p>Jobs will be dependent on success of business</p> <p>OR</p> <p>Staffing may be reduced outside peak times</p> <p>OR</p> <p>Most jobs will be seasonal</p> <p>Or other valid response.</p>	1	Any one.

Question	Expected response	Max mark	Additional guidance
6.	<p>Partial site development with marshland retained:</p> <ul style="list-style-type: none"> • Government has prioritised development of brownfield sites in heavily populated/industrial areas. The site lies in an urban area and has been heavily industrialised in the past • The site does not have any conservation designations, so there is no legislation preventing development • A major proportion of the land would stay as marshland, so development should not impact too much on wetland habitats/ wintering birds • Retaining the marsh would absorb floodwaters, so continue to help protect nearby urban areas from flooding in the event of sea level rise • Improved public footpaths and walkways would allow access to bird watchers/nature lovers/ walkers/joggers/cyclists/improve health & wellbeing • Partial development will attract visitors/create employment which will feed into the local economy • Would provide a balance between the needs of the economy and the environment <p>Or other valid response.</p>	5	<p>1 mark for each valid <u>expanded</u> point that relates to the selected option.</p> <p>Candidates may cite statements from the information provided, but these must then be discussed further. No marks for stating information provided.</p> <p>Discussion may offer counter-arguments for any of the options but should conclude with which one of the options (1, 2 or 3) should be adopted.</p>

Question	Expected response	Max mark	Additional guidance
6.	<p>Full site development, with managed parkland:</p> <ul style="list-style-type: none"> • Government has prioritised development of brownfield sites in heavily populated/industrial areas. The site lies in an urban area and has been heavily industrialised in the past • The site is polluted/covered in industrial waste, so development would remove this and leave a cleaner environment • There are already marshes in the area so some may think we could afford to lose this one • Full development will attract a lot of visitors/create employment which would feed into the local economy • Local transport infrastructure will be increased/improved through construction of new roads • Company/government will make more profit <p>Or other valid response.</p>		

Question	Expected response	Max mark	Additional guidance
6.	<p>Leave site undeveloped:</p> <ul style="list-style-type: none"> • Is one of the last sizeable areas of marsh along the river/forms part of an important estuary for over-wintering birds, so its loss would impact on biodiversity • The marsh absorbs floodwaters, so helps protect nearby urban areas from flooding • Removal of the marshes could see theme park flooded • Although polluted/covered by industrial waste, the site has high biodiversity/rare and endangered species/adapted species • Option 2 would result in loss of amenity for bird watchers/nature lovers/walkers/joggers/cyclists as would be paid access only • Option 2 would be a managed park so would lose natural habitats and reduce biodiversity/attract different species • Large numbers of visitors would result in more noise/air pollution/litter, which would impact on wildlife/local human population • New communication routes would increase traffic in the area and have visual/noise impact • New communication routes could result in wider development in the area and push up house prices/negatively impact on wildlife • Parking availability seems low for the number of predicted visitors so could overflow outside the park and affect local roads/verges/local communities <p>Or other valid response.</p>		

[END OF MARKING INSTRUCTIONS]