



National
Qualifications
2022

2022 Environmental Science

National 5

Finalised Marking Instructions

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General Marking Principles for Environmental Science National 5

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) stated 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, SEPA or INNS) 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 National 5.
- (l) 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.
- (m) 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 quadrat and quadrant, or nitrite and nitrate, or fractional distillation and frictional distillation;
 - and the term is a mixture of other terms, then do not award the mark.

- (n) 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)
- (o) 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

Section 1

Question			Expected response	Max mark	Additional guidance
1.	(a)	(i)	Deforestation/hunting/river management/poaching.	1	Any other appropriate answer (relevant to the time period) Do not accept factories.
		(ii)	NatureScot	1	Accept: Scottish Natural Heritage/SNH Do not accept: Nature Scotland, Scottish National Heritage
	(b)	(i)	Grey squirrel, Japanese knotweed.	1	Any other appropriate example
		(ii)	<p>Invasive species may outcompete native species (1), which would result in less food/fewer nesting sites/shelter for the native species (leading to a reduction in biodiversity) (1).</p> <p>OR</p> <p>Invasive species may prey on native species (1), which would cause changes to the food web/chain (1).</p> <p>OR</p> <p>Invasive species can cause destruction of habitats (1), habitat removal will mean absence of species (1).</p> <p>OR</p> <p>Invasive species can spread disease to native species (1), which results in death/weakness/infertility (1)</p>	2	<p>Cause - 1 mark Effect - 1 mark</p> <p>Any other appropriate explanation</p>

Question			Expected response	Max mark	Additional guidance
2.	(a)		A Physical (weathering) B Chemical (weathering) C Biological (weathering)	2	3 correct = 2 marks. 2 correct = 1 mark. 1 or 0 correct = 0 marks
	(b)		Weathering is the breaking down of rocks in situ at the Earth's surface over geological time due to interaction with the atmosphere. (1) Erosion is the breaking down of rock fragments into smaller pieces and sediments due to collision with other rock fragments during transportation. (1)	2	1 mark for the idea that weathering takes place in situ 1 mark for the idea that erosion involves transportation Any other valid response
3.	(a)	(i)	It is finite/will eventually run out or similar response.	1	Do not accept 'can't be used again'.
		(ii)	5.7(%)	1	
	(b)	(i)	(gravitational potential to) <u>kinetic</u> to electrical	1	Accept electric Do not accept electricity
		(ii)	Reduces the need for fossil fuels which reduces emissions. Creates habitat through creation of reservoir. Destroys habitat because reservoir floods valley. Requires diverting water and drilling through mountains, which changes ecosystems. Flood control on rivers Visual pollution	2	1 mark for each impact. Any other valid response.
		(iii)	Solar, wind, wave, tidal, geothermal.	2	1 mark for each type. Any other valid response.
	(c)	(i)	From remains of marine animals/microorganisms, compression (and heating).	2	Biological and marine origin (1) Geological process (1)
		(ii)	Fractional distillation.	1	
		(iii)	products have different <u>boiling points</u> (1) which allows products to be removed/separated at different temperatures (1)	2	

Question			Expected response	Max mark	Additional guidance
4.	(a)	(i)	PVC	1	
		(ii)	Transparent so that you can see through them (1) Resistant to fire and/or chemicals to increase personal safety (1)	2	If (a)(i) is incorrect, marks may still be awarded for appropriate explanation specific to the plastic chosen.
		(iii)	LDPE floats (on surface) so easier to extract. PS doesn't float (on the surface).	1	Must have comparison.
	(b)	(i)	Axes labelled properly (1) Axes scaled appropriately (1) Accurate plotting of data points with clear bar tops (1)	3	
		(ii)	£126,000	1	2 × £210 × 300 unit required
	(c)		Providing coloured bins for different waste material. Regular kerbside collection of waste. Education of public eg adverts in local newspapers/leaflets. Use vegetable scraps for compost.	1	Any other valid response.

Question		Expected response	Max mark	Additional guidance
5.	(a)	Water that occupies pore spaces in soil and/or bedrock.	1	Any other valid response
	(b)	(i) Lower precipitation/higher evaporation/fewer lakes and rivers/high population density/surface drainage/impermeable rock	2	Any two Indication of hot/dry climate acceptable.
		(ii) Irrigation/water for livestock/cleaning machinery/diluting chemicals.	2	Any other valid response.
		(iii) 11 700	1	
	(c)	(i) less water in the reservoirs/river levels too low for abstraction/soil moisture depleted/groundwater depleted/aquifers depleted.	1	
		(ii) Hose pipe bans/lower crop yields/higher water access costs/wildfires	1	Any other valid response. Not dehydration.
		(iii) Efficient appliances/take showers rather than baths/low flush toilets	1	Any other valid response.
	(d)	(i) The presence, absence or abundance of certain living organisms that show an environment is affected by a particular set of environmental conditions.	1	Accept level of pollution in place of environmental conditions.
		(ii) Sewage	1	Any other valid response. Fertiliser not acceptable.
		(iii) Air quality monitoring and/or control/enforcing regulations/advising government and agencies/flood warning/waste management.	1	Any other valid response.

Question			Expected response	Max mark	Additional guidance
6.	(a)	(i)	Biological resource. Renewable resource.	1	Both required. Must be only two circled, any additional terms circled award 0 marks.
		(ii)	Water, yeast, wood (barrels), glass	1	Any two from.
	(b)		8:60:1	1	Must be lowest common denominator.
	(c)	(i)	Abiotic factor: temperature/pH/flow rate/oxygen concentration/depth/turbidity. (1) Technique: 1 mark for apparatus 1 mark for how it is used.	3	
		(ii)	Reuse the cooling water. Water efficient appliances. Regular maintenance of pipes and water systems to avoid leaks. Rainwater harvesting systems	1	One from. Accept other valid points.
	(d)		Advantages: <ul style="list-style-type: none"> • Uses resources which are renewable (can be grown) • Biomass plants can use waste products. • Dependency on fossil fuels is reduced. Disadvantages: <ul style="list-style-type: none"> • Biomass still produce greenhouse gases. • Growing biomass uses up valuable farmland. 	2	One mark for an advantage. One mark for a disadvantage. Accept other valid points. Cost issues not acceptable.
7.	(a)		Oxygen	1	
	(b)	(i)	Greenhouse gases absorb reradiated (infrared) radiation. (1) The atmosphere is kept warmer than it would be without these gases. (1)	2	Accept named greenhouse gas in place of "greenhouse gases". Any other valid response
		(ii)	Average surface temperature is raised enough to support life. Allows surface water.	1	Any other valid response.
	(c)	(i)	Photosynthesis.	1	
		(ii)	Respiration/decay or decomposition/combustion/weathering/volcanic activity.	2	Any other valid response.

Question			Expected response	Max mark	Additional guidance
8.	(a)		Nitrates.	1	
	(b)	(i)	(Nitrogen) fixation.	1	
		(ii)	Legume/leguminous	1	
	(c)		Advantage: increase crop yield, grow crops in unproductive land, more profit. Disadvantage: eutrophication, cause algal blooms, cost, residue on crops, pollution of water.	2	Any other appropriate example. Do not accept: faster growth Accept for disadvantage: the emission of greenhouse gases
	(d)	(i)	The number of farmers who use fertiliser has decreased over the 29-year period.	1	Accept: fallen
		(ii)	33%	2	1 mark for selecting appropriate values from the graph. 1 mark for correct calculation. 1986 - 120 2008 - 80

Section 2

Question			Expected response	Max mark	Additional guidance
9.	(a)	(i)	Prevailing wind blows from west (to east taking pollutant gases toward the east side of the refinery.)	1	Wind effect identified.
		(ii)	They will decline because there's no coal dust/less air pollution/less particulates in the air OR No change/increases as other factors (eg Covid-19) may have a negative impact	1	Accept: It is impossible to predict because of all of the conflicting variables/inputs. Or any other valid response
	(b)	(i)	It will slow down (1) as less greenhouse gas emissions from cars/refineries will have less demand for petroleum products like this. (1) OR No change. (1) Scotland/UK is a (relatively) small country so our reduction in greenhouse gases will have an insignificant impact globally. (1)	2	1 mark for prediction. 1 mark for explanation. Or any other valid response
		(ii)	It will fill with sea water/flood.	1	
		(iii)	(Using the map scale,) combined coastal frontage of refinery and chemical works would use all the available funds. (1) no funding will be available to protect the town. (1)	2	
	(c)	(i)	place where an organism lives	1	Not its 'home'
		(ii)	geology, plant life, <u>other</u> animals	1	Or other valid response
	(d)		Lighter/grey colour in winter makes it better camouflaged (from predators)	1	Or other valid response

Question			Expected response	Max mark	Additional guidance
9.	(e)	(i)	Bar tailed godwit	1	(have to ensure they use the summer plumage diagram)
		(ii)	Ringed plover has short beak, curlew does not/has long beak.	1	Must have a comparison. 'Longer'/'Shorter' acceptable as comparison.
		(iii) (A)	X - cockle Y - hydrobia Z - ragworm	1	
		(iii) (B)	Z	1	
		(iii) (C)	Avoid competition.	1	
		(iii) (D)	Fewer species present/less food for birds/bar-tailed godwit/bird X (or incorrect species if given in i)/lower biodiversity.	1	Or any other valid response

Question		Expected response	Max mark	Additional guidance
9.	(f)	<p>Arguments for:</p> <p>The container terminal will create hundreds of new jobs.</p> <p>The rail network will be improved which will make the transport infrastructure in this area more efficient.</p> <p>The development of the terminal and improved rail links will attract new industries to this area which will create even more jobs.</p> <p>The local economy will have its annual income boosted by £25 million.</p> <p>The new motorway means that road transport on both shores of the estuary has recently been upgraded allowing the containers to be transported to and from the terminal efficiently.</p> <p>Other industries will be attracted by the proximity of the terminal.</p> <p>Arguments against:</p> <p>The estuary needs to be dredged to increase water depth to allow access for larger ships this will speed up the water flow exiting and entering the estuary: this will cause erosion to the mud flats and destroy the SSSI on the north shore</p> <p>Wading birds will have a reduced area in which to feed and breed because the establishment of the terminal will threaten their environment.</p> <p>Source three suggests that container ships are large and as the estuary already has oil tankers, there is an increased risk of a shipping accident which could result in a serious oil spill.</p> <p>No current funding for sea walls to protect the container terminal.</p> <p>Increased emissions from shipping and transport.</p> <p>Noise/visual pollution.</p> <p>Buildings could be submerged if sea levels continue to rise.</p>	4	Or any other valid response

Section 3

Question		Expected response	Max mark	Additional guidance
10.	A	<p>Pitfall trap named. Labelled diagram. Sunk into soil so that top of pot comes to soil level. Alcohol/ethanol to kill/preserve organisms. Disguised with a lid/leaves/sticks. Set up several/many traps. Check frequently. Identify organisms using a key.</p>	7	<p>Any other valid response. Any 7 for 1 mark each.</p>
	B	<p>Quadrat named. Labelled diagram. Rule to decide if plants partly in quadrat are counted or not. Throw/drop randomly. Throw/drop/repeat lots of times. Count number of specific species Estimate area of ground cover Use an appropriate size of quadrat. Use a key to identify plants.</p>	7	<p>Any other valid response. Any 7 for 1 mark each.</p>

Question		Expected response	Max mark	Additional guidance
11.	A	<p>Choice of destination:</p> <ul style="list-style-type: none"> • Avoid long haul travel by holidaying in the UK/staycation • Carbon off-setting of flights • Avoid environmentally sensitive destinations, eg fragile reef ecosystems, turtle nesting beaches • Stay in eco-tourist resorts (+ description of examples.). <p>Mode of travel:</p> <ul style="list-style-type: none"> • Avoid flights • Use public transport • Use sustainable forms of transport, eg cycling, electric vehicles • Reduce weight of luggage being transported. <p>Activities:</p> <ul style="list-style-type: none"> • Avoid activities that use further transport/burn fossil fuels (or example) • Avoid activities involving exploitation of animals, or example • Participate in activities that support the environment, eg beach clean, 'green gym' type activities, etc. • Take reusable bottles • Buy eco-friendly toiletries • Take litter home with you <p>Souvenirs:</p> <ul style="list-style-type: none"> • Do not buy products that exploit resources, eg shells, animal products, etc • Support locally produced souvenirs. 	7	<p>Any other appropriate. 1 mark for each point made.</p> <p>Need to have justification as to why suggestion reduces impact on the environment.</p>

Question		Expected response	Max mark	Additional guidance
11.	B	<p>Change to a vegetarian/vegan diet because:</p> <ul style="list-style-type: none"> • Less energy lost as one less link in the food chain • Some meat is produced intensively which can result in: <ul style="list-style-type: none"> – Deforestation/habitat destruction – Increased methane levels. <p>Buy locally produced food/avoid buying food from distant countries because:</p> <ul style="list-style-type: none"> • Less food miles so less CO₂ emissions <p>Eat seasonally because:</p> <ul style="list-style-type: none"> • Less storage impact (eg chilling stores, etc). <p>Use organic produce because:</p> <ul style="list-style-type: none"> • Less pesticide use • Description of impact of pesticides on food chains/ biomagnification • Less chemical fertilisers used • Description of eutrophication. <p>Have less food waste by:</p> <ul style="list-style-type: none"> • Buying less • Smaller portions • Use leftovers. <p>Buy food with less packing/ reusable packaging</p> <ul style="list-style-type: none"> • To avoid plastic going to landfill 	7	<p>Any other appropriate. 1 mark for each point made.</p> <p>Need to have justification as to why suggestion reduces impact on the environment.</p>

[END OF MARKING INSTRUCTIONS]