National
Qualifications
RESOURCE

X826/75/01 Environmental Science

Marking Instructions

Please note that these marking instructions have not been standardised based on candidate responses. 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.

General marking principles for National 5 Environmental Science

This information is provided to help you understand the general principles you must apply when marking candidate responses to questions in this paper. These principles must be read in conjunction with the detailed marking instructions, which identify the key features required in candidate responses.

(a) Marks for each candidate response must **always** be assigned in line with these general marking principles and the detailed marking instructions for this assessment.

(b) Marking should always be positive. This means that, for each candidate response, marks are accumulated for the demonstration of relevant skills, knowledge and understanding: they are not deducted from a maximum on the basis of errors or omissions.

(c) If a specific 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 must seek guidance from your team leader.

(d) There are no half marks awarded.

(e) Where a candidate makes an error at an early stage in a multi-stage calculation, credit should normally be given for correct follow-on working in subsequent stages, unless the error significantly reduces the complexity of the remaining stages. The same principle should be applied in questions which require several stages of non-mathematical reasoning.

(f) Unless a numerical question specifically requires evidence of working to be shown, full marks should be awarded for a correct final answer (including unit) on its own.

(g) Where a wrong answer (for which no credit has been given) is carried forward to another step, credit will be given provided the end result is used correctly.

Marking instructions for each question

Section 1

Question			Expected answer(s)	Max mark	Additional guidance
1	(a)	(i)	The Sun	**1**	
		(ii)	Arctic hare	**1**	Do not accept: hare (on its own)
		(iii)	Energy moving from (arctic) hare and/or snowy owl to (arctic) fox (1) **and** from (arctic) fox to (arctic) wolf. (1)	**2**	Arrows indicate direction of energy flow (1) mark For full marks, there must be a comment on energy movement to and from.
		(iv)	Snowy owl eats stoat but rough-legged hawk doesn't.	**1**	Accept: Snowy owl has an alternative food source. Snowy owl is nocturnal but the rough-legged hawk is not. The two have different niches.
	(b)	(i)	Paint mark/clipping hair/tag	**1**	Any other valid response
		(ii)	36	**1**	12 × 15 ÷ 5
	(c)	(i)	White gives it camouflage during snowy winter **OR** Brown gives it camouflage when snow not present **OR** Camouflage **OR** Helps it avoid predation	**1**	Any other valid response
		(ii)	Adaptation	**1**	
		(iii)	Numbers decrease **(1)** as it would be less camouflaged **(1)**.	**2**	Accept: Less likely to go white (1) so it would still be camouflaged in the non-snowy environment. (1) OR Less likely to go white **(1)** so it wouldn't be camouflaged when it does snow**(1)**. Any other valid response

Question			Expected answer(s)	Max mark	Additional guidance
2.	(a)		Dysentery/cholera/salmonellosis.	**1**	Any one
	(b)		Fuel may not be available locally Because of deforestation Lack of money to buy fuel To save money	**2**	Any two valid responses for (1) mark each Any other valid response.
	(c)	(i)	105 mins OR 1 hour 45 minutes OR 1·75 hours	**2**	(5 people × 3 litres × 7 days =) 105 (l) **(1)** (105 litres × 1 min/l =) 105 mins **(1)** Accept: Must include units otherwise maximum (1) mark
		(ii)	Use of technology allows present generation to access/use resources without compromising needs of future generations.	**1**	Any other valid response. Response must talk about not compromising the need of future generations.
	(d)		SEPA	**1**	Accept Scottish Water.
	(e)		Shower instead of bath Don't leave tap running when cleaning teeth Mend dripping taps Use 'grey' water for garden irrigation	**1**	Any other valid response.
3.	(a)		A carbon footprint is a measure of the mass of carbon dioxide emitted by a specific activity.	**1**	Accept: Emitted by a person/pet
	(b)	(i)	1 mark for completing headings with units 1 mark for correct order as follows: goldfish, budgie, hamster, cat 1 mark for correct values for each pet	**3**	Units can be in the body of the table instead of heading
		(ii)	0·84 (gha)	**1**	280 × 0·003 = 0·84 gha

Question			Expected answer(s)	Max mark	Additional guidance
4.	(a)		Pans/gates/furniture/nails	**1**	Any other valid response
	(b)	(i)	Formed in sea water as a result of oxygen release by photosynthesising organisms. **(1)** The oxygen combines with dissolved iron in the ocean to form iron oxide. **(1)**	**2**	Any other valid response
		(ii)	Blast furnace	**1**	
	(c)		570 (tonnes)	**1**	95% of 300 tonnes = 285 tonnes × 2 kelpies = 570 tonnes
	(d)	(i)	3 (metres)	**1**	$\frac{1}{10}$ of 30 m
		(ii)	Burning fossil fuels to transport models/traffic congestion caused by lorry/emissions of greenhouse gases.	**1**	Any other valid response

Question			Expected answer(s)	Max mark	Additional guidance
5.	(a)		(An SSSI is designated as of particular interest because of its:) fauna/flora/geology/geomorphology	**1**	Or any other valid response
	(b)	(i)	For example: Stakeholders: anglers/watersport enthusiasists; mountain bikers/walkers; conservationists/hunters Reasons for conflict: Lines tangle with boards, going too fast/blocking path, birds scared away	**2**	1 mark for each valid reason Or any other valid response
		(ii)	Signage, zoning eg cycle routes, code of conduct, rangers monitoring,	**2**	1 mark for each valid action Any other valid response Accept role of National Park if an understanding of what it does is there Must be linked to (b)(i)
	(c)		9·3	**2**	1·64 - 1·50 = 0·14 (1) $\frac{0{\cdot}14}{1{\cdot}50} \times 100$ Accept 9, 9·33, 9·333
	(d)	(i)	pine marten **OR** red grouse	**1**	
		(ii)	For: provides employment/income, red deer are not endangered/benefit for forestry. Against: land managed for hunting limits forest growth/biodiversity. Shooting interferes with walkers/ birdwatchers etc. Personal beliefs/ethics	**2**	Any other valid reason
		(iii)	Captive breeding/legislation/habitat improvements/nest cameras/control of predators/disease control/hunting ban	**1**	Any other valid response

Question			Expected answer(s)	Max mark	Additional guidance
5.	(d)	(iv)	Native forest will consist of trees which have existed in Scotland since the ice age such as Scots pine, rowan, birch, whitebeam etc. **(1)** Native forest will tend to have an open canopy. Plantations tend to be dense, closed canopy and often monoculture. **(1)** Plantations are planted and maintained for commercial or other human needs. **(1)**	**2**	One mark for each explained difference. Any other valid response
		(v)	SNH (Scottish Natural Heritage)	**1**	Accept NatureScot Do not accept: Scottish National Heritage

Question			Expected answer(s)	Max mark	Additional guidance
6.	(a)		Movement/kinetic energy is converted into electrical energy	**1**	Do not accept: electricity
	(b)		No greenhouse gases	**1**	Any other valid response but must relate to an environmental benefit.
	(c)	(i)	40%	**1**	
		(ii)	Each advantage **(1)** - Less visible - More wind - Less noise pollution	**2**	Any other valid response
	(d)		Fisherman – fishing may be disrupted/unable to use nets/fish habitats destroyed Coastal hotel owners – views interrupted/noise from turbines Sailing clubs – spoil sailing routes/ difficult to navigate around	**1**	Any one reason. Any other valid response
	(e)		Coal/oil/gas/nuclear/peat	**1**	
7.	(a)		narrow channel, large water volume, large tidal stream, population density, proximity to National Grid, current water use	**3**	Any 3 for (1) mark each Any other valid response
	(b)		Disrupts species migration, sea bird feeding populations/sound disruption affecting whales/dolphins **(1)** Fishing vessels can't access so lose income, creates jobs which put money into the local economy, financial cost of maintenance is high, expensive to connect to National Grid. **(1)**	**2**	Any other valid response Do not accept greenhouse gases.

Question			Expected answer(s)	Max mark	Additional guidance
8.	(a)	(i)	A: Igneous B: Sedimentary C: Igneous D: Metamorphic E: Sedimentary F: Metamorphic	**3**	6 correct = 3 marks 4/5 correct = 2 marks 2/3 correct = 1 mark 0/1 correct = 0 marks
		(ii)	It contains pore spaces capable of storing water. **(1)** It is formed under the sea so plenty of water is available. **(1)**	**2**	Do not accept: because they are porous.
	(b)	(i)	Physical weathering (freeze thaw/ frost shattering) **(1)** Chemical/solution weathering **(1)** Biological weathering **(1)**	**2**	Any 2 valid responses for (1) mark each
		(ii)	This rock face will not get much sun as it faces north. It will be very vulnerable to frost shattering in the wet climate. **(1)** Rock/boulders will fall off the cliff onto the road and lead to road closure. **(1)** The faults (weaknesses) will allow water to penetrate which will speed up the process of frost shattering rock which will fall onto the road. **(1)** The weaknesses (faults) slope down at an angle towards the road. Frost shattering may prise off very large sections of the cliff face. **(1)**	**2**	Accept any two answers for (1) mark each Any other valid response

Section 2 has been removed

Section 3

Question			Expected answer(s)	Max mark	Additional guidance
10.	A		Chosen activity – fertiliser application/pesticide application/ cattle farming **(1)** Fertiliser application -Fertiliser run-off into waterway **(1)** -Causes algal bloom **(1)** -Decomposition of algae reduces oxygen **(1)** -Death of other organisms **(1)** Pesticide application -Pesticide run-off into waterway **(1)** -May kill organisms directly **(1)** -Absorbed by aquatic organisms **(1)** -Poison water supplies **(1)** Cattle farming -Slurry run-off into waterway **(1)** -Causes algal bloom **(1)** -Decomposition of algae reduces oxygen **(1)** -Death of other organisms **(1)** -Methane emissions contribute to climate change **(1)** -Cattle may damage the riverbanks **(1)** b) Fertiliser application -Organic farming **(1)** -Restrict amount of fertiliser spread **(1)** -Where/when it can be spread **(1)** -Use farmyard manure **(1)** -Use nitrogen fixing crops **(1)** Pesticide application -Organic farming **(1)** -Restrict amount of pesticide spread **(1)** -Use biological control **(1)** -Crop rotation **(1)** -Hand weeding **(1)** Cattle farming -Have fewer cattle **(1)** -Don't have them in fields next to waterways **(1)** -Fence off waterways **(1)** -Collect slurry and spread in a controlled way **(1)**	**7**	Max 4 for either descriptions of damage or discussion of solutions Any other valid response

Question			Expected answer(s)	Max mark	Additional guidance
10.	B		Possible areas of discussion include: - Marine conservation areas, - zoning, - sustainable fishing methods, - quotas, - legislation, - net size, - consuming alternative species. Example of expected response; Net size is a method of conserving fish stocks (1) Smaller nets ensure smaller numbers of fish are caught **(1)**. Larger holes in the net allow small fish to escape **(1)** and leave behind breeding stock **(1).**	**7**	Maximum of four marks for one method Maximum of (3) marks for a simple list of named methods. Any other valid response

Question			Expected answer(s)	Max mark	Additional guidance
11.	A		Processes: Fixation by soil bacteria/lightning (1) + leguminous plants/bacteria fix atmospheric N eg clover, peas (1) Nitrate absorption by plants (1) Consumption/feeding by animals (1) Nitrogen for protein synthesis or amino acids. Component of proteins. (1) Death and organic waste production (urine/manure) (1) Decay/decomposition by fungi and bacteria (1) Nitrification by bacteria (1) + ammonia to nitrite then nitrite to nitrate (1) Denitrification by bacteria (1) – nitrates to nitrogen (1) The nitrogen cycle results in the recycling of nutrients. (1)	**7**	A diagram may be included as part of the response, but the response must also include explanation of the various stages of the cycle. Maximum of (3) marks for a correct, labelled diagram of the nitrogen cycle without further discussion.

Question			Expected answer(s)	Max mark	Additional guidance
11.	B		Processes: Photosynthesis (1) + photosynthesis word/chemical equation or description (1) Respiration (1) + respiration word/chemical equation or description (1), Consumption/feeding by animals (1) Death and organic waste production (urine/manure) (1) Decay/decomposition by fungi and bacteria/detritivores and decomposers (1) Formation of fossil fuels. (1) Formation of limestone. (1) Combustion of fossil fuels (1) releases carbon dioxide. (1) The carbon cycle results in the recycling of nutrients.(1)	**7**	A diagram may be included as part of the response, but the response must also include explanation of the various stages of the cycle. Maximum of (3) marks for a correct, labelled diagram of the carbon cycle without further discussion.

[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
Section 1					
1	(a)(i)	Living Environment - Interdependence	K1	1	
	(a)(ii)	Living Environment - Interdependence	K3	1	
	(a)(iii)	Living Environment - Interdependence	K2	2	1
	(a)(iv)	Living Environment - Interdependence	S2	1	
	(b)(i)	Living Environment - Investigating ecosystems and biodiversity	K2	1	
	(b)(ii)	Living Environment - Investigating ecosystems and biodiversity	S4	1	
	(c)(i)	Living Environment - Interdependence	S6	1	
	(c)(ii)	Living Environment - Interdependence	K1	1	
	(c)(iii)	Living Environment - Interdependence	S5	2	1
2	(a)	Sustainability - Water	S2	1	
	(b)	Sustainability - Water	K3	2	1
	(c)(i)	Sustainability - Water	S4	2	
	(c)(ii)	Sustainability - Introduction	K3	1	1
	(d)	Sustainability - Water	K1	1	
	(e)	Sustainability - Water	K1	1	
3	(a)	Sustainability - Food	K1	1	
	(b)(i)	Sustainability - skill	S3	3	
	(b)(ii)	Sustainability - skill	S4	1	
4	(a)	Earth's Resources - Geosphere	K1	1	
	(b)(i)	Earth's Resources - Geosphere	K2	2	2
	(b)(ii)	Earth's Resources - Geosphere	K1	1	
	(c)	Earth's Resources - skill	S4	1	1
	(d)(i)	Earth's Resources - skill	S4	1	
	(d)(ii)	Sustainability - Energy	S5	1	
5	(a)	Living Environment - Human influences on biodiversity	K1	1	
	(b)(i)	Living Environment - Human influences on biodiversity	K3	2	1
	(b)(ii)	Living Environment - Human influences on biodiversity	K3	2	1
	(c)	Living Environment - skill	S4	2	1
	(d)(i)	Living Environment - Interdependence	K3	1	
	(d)(ii)	Living Environment - Human influences on biodiversity	K2	2	1
	(d)(iii)	Living Environment - Human influences on biodiversity	K3	1	
	(d)(iv)	Earth's Resources - Biosphere	K2	2	2
	(d)(v)	Living Environment - Human influences on biodiversity	K1	1	
6	(a)	Earth's Resources - Atmosphere	K1	1	
	(b)	Earth's Resources - Atmosphere	K1	1	
	(c)(i)	Earth's Resources - skill	S4	1	
	(c)(ii)	Earth's Resources - Atmosphere	K2	2	1
	(d)	Earth's Resources - Atmosphere	S6	1	
	(e)	Sustainability - Energy	K1	1	
7	(a)	Earth's Resources - Hydrosphere	K1	3	1
	(b)	Earth's Resources - Hydrosphere	K3	2	1

8	(a)(i)	Earth's Resources - Geosphere	K1	3	
	(a)(ii)	Earth's Resources - Geosphere	K2	2	1
	(b)(i)	Earth's Resources - Geosphere	K1	2	1
	(b)(ii)	Earth's Resources - Geosphere	K2	2	1

(Section 2 removed)

Section 3					
10	A	Sustainability - Food	K2	7	3
	B	Sustainability - Food	K2	7	3
11	A	Living Environment - Interdependence	K2	7	3
	B	Living Environment - Interdependence	K2	7	3