



National
Qualifications
2019

2019 Environmental Science

National 5

Finalised Marking Instructions

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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)		Diagram B	1	
	(b)		A naturally occurring solid material from which a metal or valuable mineral can be extracted profitably	1	
	(c)	(i)	20 000 000 (m ³)	1	$500 \times 100 \times 400 = 20\,000\,000 \text{ m}^3$
		(ii)	80 000 000 (tonnes)	1	$4 \times 20\,000\,000 = 80\,000\,000$ Or consistent with (c)(i)
2.	(a)	(i)	Carries more passengers Fewer flights needed More profitable for airline More fuel efficient per passenger	1	Any other valid response
		(ii)	247 500 (kg)	1	
	(b)	(i)	Crude oil	1	
		(ii)	Fractional distillation OR Distillation of crude oil	1	Any one
	(c)		Methane; nitrous oxide	1	Water vapour; CFCs; HFCs Any other valid response
	(d)	(i)	Compensating for emissions of carbon dioxide into the atmosphere with an equivalent reduction of carbon dioxide elsewhere.	1	Accept any valid response Response should refer to no net release of carbon dioxide into the atmosphere
		(ii)	Airlines pay for tree planting to offset carbon emissions Airlines pay for sustainable practices Investing in biofuels Supporting use of renewables	1	Any one Any other valid response

Question			Expected answer(s)	Max mark	Additional guidance		
2.	(e)		See table for answers	3	6 correct statements = 3 marks 4 or 5 correct statements = 2 marks 2 or 3 correct statements = 1 mark 0 or 1 correct statement = 0 marks		
		1	Aircraft has 2 engines Aircraft has 4 engines			Go to 2 Go to 4	
		2	Narrow bodied Wide bodied aircraft			PB-737 Go to 3	
		3	Metal construction Carbon fibre construction			PA-350 PB-787	
		4	Capacity for under 500 passengers Capacity for over 500 passengers	PB-747 PA-380			
3	(a)	(i)	Better health/welfare/access to food/water/medicines/lower death rate	1	Any other valid response that links to increase life expectancy		
		(ii)	Non-renewable: oil/gas/coal/nuclear	1			
		(b)	27(%)	1	Accept 26.79% and 26.8%		
4.	(a)		y-axis labelled properly (1) y-axis scaled appropriately (1) Accurate plotting of data points with clear bar tops (1)	3	Allow half box tolerance		
		(b)	21:17			1	
		(c)	(i)			Products come with lots of packaging to protect items during transport. Consumers reluctant to buy items which are not perfect.	1
		(ii)	Appear more green - increase their reputation/reduce costs of transport/storage/materials	1	Any other valid answer		

Question			Expected answer(s)	Max mark	Additional guidance
4.	(c)	(iii)	Recycling bins: less waste sent to landfills/food can be composted Metal cutlery in canteen: used indefinitely/less plastic waste Remove use of straws: reduces plastic waste/some are non-recyclable Paper-free schools/increased ICT use: save trees	2	Any other valid answer
5.	(a)	(i)	Shore crab Herring gull	1	
		(ii)	Direction of energy flow	1	
		(iii)	Increases: less competition from barnacles. Less being eaten by shore crabs. Decreases: because herring gull will consume more dog whelk. Stays the same: mixture of above.	1	
		(iv)	Salmon/cod/herring/prawns/mussels etc	1	
	(b)	(i)	Producer	1	Accept autotroph
		(ii)	Light (energy)	1	Accept chlorophyll
		(iii)	Transect- sampling (1) tape measure and quadrat (1) to sample percentage cover of seaweed (1)	3	1 mark for sampling 1 mark for equipment 1 mark for the description of its use. Accept other valid response
	(c)		Feed on dead organic matter (1) Recycling nutrients for other organisms to use (1)	2	

Question		Expected answer(s)	Max mark	Additional guidance
6.	(a)	physical weathering physical weathering chemical weathering biological weathering	3	4 correct = 3 marks 3 correct = 2 marks 2 correct = 1 mark 0-1 correct = 0 marks
	(b)	13 450 000 years	2	$1345\text{m} = 1345000 \text{ mm} \div 0.1 = 13.45$ million years 1 mark for conversion of mm to m (or m to mm) 1 mark for correct answer
	(c)	Erosion: The breakdown of rock fragments (into smaller pieces) due to <u>collision</u> (with other rock fragments) during <u>transportation</u> . Whereas Weathering: Exposure and breaking down of rocks <u>in situ</u> at the earth's surface over geological time due to <u>interactions</u> <u>with the atmosphere</u> .	2	1 mark for comparing <u>where</u> breakdown occurs 1 mark for comparing <u>how</u> breakdown occurs
7.	(a)	A: shale B: slate C: basalt	2	3 for 2 marks 2 for 1 mark
	(b)	It contains pore spaces capable of storing water/it's a porous rock (1) It is formed under the sea so plenty of water is available. (1)	2	

Question		Expected answer(s)	Max mark	Additional guidance
8.	(a)	<p>Spraying eg slurry from the fields may reduce air quality due to unpleasant smell, methane emissions. Pesticides may be hazardous to human health</p> <p>Limestone quarry producing powdered limestone dust from explosions and crushing plant</p> <p>Main road vehicle emissions/ particulates in engines dangerous for human health/release of greenhouse gases/can cause smog</p>	3	One mark for each valid explanation
	(b)	(i)	1	
		(ii)	2	
8.	(c)	<ul style="list-style-type: none"> • Nitrates from fields causing eutrophication. • Agro-chemicals washing into river harming aquatic life. • Polluted runoff from old mine workings will contain dissolved metals poisoning aquatic life. • Excess alkaline from crushed limestone will alter pH in the river. • Returned heated water from the coal power station will raise the temperature reducing dissolved oxygen. • Sewage from the city being discharged into the river will increase bacteria. 	2	1 mark for activity 1 mark for reason Any valid response
	(d)	(i)	1	
		(ii)	1	
		(iii)	1	

Question			Expected answer(s)	Max mark	Additional guidance
8.	(e)	(i)	Land fill Nature reserve Diving centre/climbing centre	1	Any other valid response
		(ii)	Land fill - Creates jobs Nature reserve - enhances local environment and lets biodiversity recover. Diving centre/climbing centre - provides recreational activities.	1	Any other valid response
9	(a)		<ul style="list-style-type: none"> • Significantly increased yield. Food becomes more affordable to the consumer/increases profit margin for farmer • The same area of land is able to supply food and fibre for a larger population reducing the risk of starvation. • The preservation of existing areas of woodland and rainforest habitats which would need to be felled for extensive farming methods in the same geographical location/this also leads to a reduction in CO₂ generation. • In the case of intensive livestock farming: an opportunity to capture methane emissions which would otherwise contribute to global warming. • Once methane is captured, these emissions can be used to generate heat and/or electrical energy, thereby reducing local demand for fossil fuels. 	2	
	(b)		<ul style="list-style-type: none"> • Crops can cross-breed with native species. • Loss of gene pool. • Can produce super weeds. • Reduced pollinators. 	1	Any other valid reason

Question			Expected answer(s)	Max mark	Additional guidance
9.	(c)	A	<p>Social</p> <ul style="list-style-type: none"> • Some people regard organic produce to be more flavoursome/healthy • More employment opportunities if weed control for example needs to be done manually • People may not want to pay premium for organic produce • Product may not have as a long a shelf life as conventionally produced product • Can't support world food security 	1	
		B	<p>Economic</p> <ul style="list-style-type: none"> • Farmers may save costs by avoiding costs of purchasing agro-chemicals • Fewer resources used in the production/delivery of agro-chemicals • Product may have increased value • Increased production costs if additional labour for manual control of weeds, etc is employed • May only be a small/niche market for organic produce • Lower yield may produce less profit 	1	
		C	<p>Environmental</p> <ul style="list-style-type: none"> • Insect/weed pests are not killed • biodiversity is maintained • Fertilisers not used which may leach into waterways (and cause eutrophication) • Additional land needs to be brought into production to make up shortfall • Pest species may get out of control resulting in crop failure 	1	

Section 2

Question			Expected answer(s)	Max mark	Additional guidance
10.	(a)	(i)	Upper deposit has more sand with the required particle size Upper deposit is more accessible/ cheaper to access.	2	1 mark for each
		(ii)	Site X has sand of a suitable grade The source of sand is within 10 km of the factory Main road for transportation 10 people in the local area could be employed	2	1 mark for each
	(b)	(i)	(A) Site 1 - coniferous woodland (1) (B) Site 2 - deciduous/mixed woodland, river, grassland/ agricultural land (any two for 1 mark each)	1 2	
		(ii)	Greater range of habitats	1	
	(c)	(i)	<ul style="list-style-type: none"> • prefers forest • eats rabbits, mice, hares, and voles • and has no known predators 	2	2 marks for all 3 statements 1 mark for any 2 statements 0 marks for 1 statement
		(ii)	Scottish Natural Heritage	1	
		(iii)	<ul style="list-style-type: none"> • less harmful • less frightening for the cats • more likely to get results with the camera trap • safer for staff as they don't need to handle the cats 	1	Any one
		(iv)	Scottish wildcat - on the basis that tail is clearly bushy/tail has broad stripes/brown feet/no spots on back	1	Any one for 1 mark

Question			Expected answer(s)	Max mark	Additional guidance
10.	(c)	(v)	Can't see all of its feet so can't confirm if they're white or not/ difficult to see if there are any spots on its back/can't see end of tail/ picture in black and white/no scaling on picture (ie how large the cat is)	1	Do not accept 'picture not clear enough'
		(vi)	5	1	Must be whole number
		(vii)	Habitat loss - plant more forests/ halt logging of existing forests. Deaths by road accidents - put signs up warning drivers/impose speed limits/build underpasses (habitat corridors) for wildcats, etc. Spread of disease - vaccinate domestic cats/prevent people from owning cats in area/cat owner education, etc.	1	Any other valid response
10.	(d)		Site 1 only Coniferous plantation has limited biodiversity/habitat loss. It will abut onto housing that is already there (Newlands). It has flat ground for building It is better than site 2 because it will not ruin the view south (Source F) for the inhabitants of Newlands. (The view to the north is a woodland slope.). It is close to the block factory thus reducing the environmental fuel costs in transporting such a bulky product. It is better than site 2 because it does not encroach on the historical chambered cairns/Culloden Battlefield site. It is better than site 2 because to build at site 2 would require the destruction of woodland that has extensive biodiversity. The block factory will be able to employ ten people for 4 years. (Source C)	4	Credit should be given for each valid point. Marks should not be awarded for both sides of the same argument. Marks can be awarded for valid arguments if candidate chooses neither housing development should go ahead.

Question		Expected answer(s)	Max mark	Additional guidance
10.	(d)	<p>(continued)</p> <p>Site 2 only It will face housing that is already there, expanding Newlands village.</p> <p>Creation of larger village could stimulate local service provision reducing the need for environmentally damaging car journeys into Inverness.</p> <p>It is on a south facing slope with pleasant views (Source F)/the potential for the houses to use solar energy to the benefit of the environment.</p> <p>Using source A, B and F, site 2 is gently sloping so suitable for building on.</p> <p>Using source A, B and F, site 2 is mainly being used for grass/grazing livestock, suggesting that it is low quality farmland.</p> <p>It is better than site 1 because there are no threats to rare/endangered species such as the Scottish Wildcat.</p> <p>It is close to the block factory and potential sand quarry, thus significantly reducing the environmental fuel costs in transporting such bulky products.</p> <p>The block factory will be able to employ ten people for 6 years. (Source 2)</p>		

Question		Expected answer(s)	Max mark	Additional guidance
10.	(d)	<p>(continued)</p> <p>Site 1 should not go ahead as it will destroy the habitat of the rare Scottish wildcat especially as one has been positively identified in this area.</p> <p>Site 2 encroaches far too close to the historical sites of Culloden Battlefield and Clava Cairns. It will ruin the ambiance of these areas.</p> <p>Site 2 will require a diverse woodland habitat to be destroyed.</p> <p>The house building will be an intrusive visual blight on an attractive semi-rural landscape that supports a varied geological and living environment.</p> <p>Because there are more houses being built on Site 2 the road network may not be designed to cope with the increased volume of heavy traffic.</p> <p>The campsite will no longer be set in a tranquil rural setting. It may lose customers and close. The jobs and revenue that are currently spent in the area by caravanners and campers will offset any gain from jobs in the block factory.</p>		

Section 3

Question		Expected answer(s)	Max mark	Additional guidance
11.	A	<p>Potential Stages - Evaporation/condensation/ precipitation/transpiration/run-off/ infiltration/percolation/ throughflow/groundwater flow and storage.</p> <p>Examples of appropriate descriptions for each stage:</p> <p>Water from the oceans/seas evaporates due to the heat from the sun</p> <p>Water is transpired from plants and evaporated from the soil.</p> <p>The water vapour rises into the atmosphere where due to the cooler temperatures the water vapour condenses into clouds.</p> <p>Water droplets fall as precipitation from the upper atmosphere.</p> <p>Examples of precipitation are; rain, hail and snow.</p> <p>The water cycle continually repeats.</p> <p>Any other valid description of a stage</p>	7	<p>1 mark per named stage up to a maximum of 3 marks 1 mark per description of process</p> <p>Maximum of 7 marks</p>

Question		Expected answer(s)	Max mark	Additional guidance
11.	B	<p>Composition: nitrogen, oxygen and carbon dioxide (and named trace gases)</p> <p>Natural Greenhouse effect:</p> <ul style="list-style-type: none"> • Energy from the Sun is absorbed by the Earth's surface. • Some of the radiation is reflected from the Earth's surface (ice/snow/water). • Energy is re-radiated from the Earth's surface (long wave). • Energy is absorbed by greenhouse gases in the atmosphere. • Which prevent some of the heat energy from escaping into space. • This keeps the Earth warmer than it would otherwise be • Keeps Earth habitable. 	7	<p>Composition: 3 marks max</p> <p>Natural Greenhouse effect description: 4 marks</p>

Question		Expected answer(s)	Max mark	Additional guidance
12.	A	<p>Wind</p> <ul style="list-style-type: none"> • Sustainable because it is a renewable resource. • Wind blows onto angled blades causing it to spin. • This converts kinetic energy to electrical energy. • Environment - eye-sore/less harmful gases/migration patterns of birds/noise production. • Society - noise production/eye-sore/increased revenue in community/increased jobs/initial cost is high/potential for economic benefit by selling back to the grid/individual wind turbines in community. <p>Hydro</p> <ul style="list-style-type: none"> • Hydro is sustainable because we can use the resource now and in the future/renewable resource. • (Water is stored - potential energy and is then released) kinetic energy of moving water turns the turbine which generates electrical energy to produce electricity. • Environment - flooding from dams/water shortages in other areas/fish migration. • Society - tourism/jobs/flooding of homes/businesses. <p>Tidal</p> <ul style="list-style-type: none"> • Sustainable because we can use the resource now and in the future/renewable resource. • Kinetic energy of moving water turns the turbine which generates electrical energy to produce electricity. • Environment - eye sore/noise/impact on marine organisms/damage to sea bed. • Society - impact on fishing/increased jobs/initial cost is high/potential for economic benefit by selling back to the grid/eye-sore. 	7	<p>1 mark each</p> <p>Maximum of three from first four responses</p> <p>Accept each answer only once</p> <p>Maximum two from environment Maximum two from society</p> <p>Any other acceptable answer</p> <p>Labelled diagrams are acceptable</p> <p>Potential energy not required</p>

Question		Expected answer(s)	Max mark	Additional guidance
12.	B	<p>A sustainable water supply means having water available to use now and also ensuring the water supply will still be available in the future.</p> <p>Basic hygiene education:</p> <ul style="list-style-type: none"> • providing education on the problems with open defecation • importance of separating drinking water from that of water for other uses such as bathing. • educating parents will allow them to be able to teach their children and future generations. <p>Policies:</p> <ul style="list-style-type: none"> • implement policies in developing countries to manage water resources • ensuring they have water for agriculture/domestic purposes and industry • when it is needed, now or in the future. <p>Build sewage systems:</p> <ul style="list-style-type: none"> • having sewage in pipes minimises the risk of drinking water becoming contaminated and ensures polluted water is not consumed. <p>Bottled water:</p> <ul style="list-style-type: none"> • drinking water from bottles instead of contaminated rivers. <p>Collecting rainwater:</p> <ul style="list-style-type: none"> • use vessels to collect rainwater • recycling water for use in irrigation • less fresh water used for irrigation • meaning more will be left for drinking and bathing • growing crops which can grow with little irrigation ensures that less water will be needed for watering crops in fields and more can be saved for other purposes. 	7	<p>One mark per named method (up to max 3 marks)</p> <p>Max 4 marks for named example with description</p> <p>Any other suitable answer</p>

Question		Expected answer(s)	Max mark	Additional guidance
12	B	<p>(continued)</p> <p>Building stand pipes and pumps in villages:</p> <ul style="list-style-type: none"> • local villages have access to clean water rather than having to walk many miles to contaminated rivers • pumps have a life span of 5 - 10 years so ensuring there is a programme of maintenance in place • limiting the water available at each pump will ensure the supply is there for the future. <p>Research into water management:</p> <ul style="list-style-type: none"> • continue to research the topic and ensure latest developments are put into practice as part of an ongoing programmes. 		

[END OF MARKING INSTRUCTIONS]