



National
Qualifications
2015

2015 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 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.

Detailed Marking Instructions for each question

Question			Expected Answer(s)	Max Mark	Additional Guidance
1.	(a)	(i)	Pitfall trap	1	
		(ii)	Make results more reliable	1	Any suggestion of increasing reliability, representative
	(b)	(i)	Woodlouse 1 Pitfall traps sample organisms on the surface of the ground or similar 1	2	Underneath leaf litter
		(ii)	105	1	
2.	(a)		Any species introduced intentionally or accidentally into a new community (by human activity.)	1	Any other correct explanation, which may refer to animal, weather or environmental factors.
	(b)		Biodiversity reduced because rhododendron ponticum shades out other plants. Biodiversity is increased because flowers and/or foliage provide a food source. Biodiversity stays the same because of a combination of factors above.	2	Any other correct explanation. Marks allocated for impact and associated description.
	(c)		Any relevant legislation in protection of environment. eg Biodiversity action plans, environmentally sensitive areas, the National parks act, Marine Scotland Act, Wildlife and Countryside Act including SSSI. Environmental Protection Act	1	Any other suitable answer

Question			Expected Answer(s)	Max Mark	Additional Guidance
3.	(a)	(i)	Arrow going from nitrogen in the atmosphere to nitrates in soil	1	
		(ii)	C	1	
		(iii)	Decrease in plant growth 1 Therefore less nitrate available for healthy plant growth 1	2	
	(b)		Fertilisers/manure/guano/named chemical fertiliser	1	
4.	(a)	(i)	Woodmice	1	
		(ii)	Alternative food source 1 Occupy a different niche Feed at different times of day Feed at different levels of canopy 1	2	
		(iii)	Heat, movement, sound, indigestible waste	1	
		(b)	Fungi/bacteria 1 Recycle nutrients 1	2	
5.	(a)		A - Igneous 1 B - Sedimentary 1 C - Metamorphic 1	3	
		(b)	A- Igneous rocks are formed by <u>cooling and solidifying</u> 1 C - Metamorphic rocks are formed by other rocks being subject to <u>heat and pressure</u> 1 If incorrect name at 5a Sedimentary formed by <u>compression of layers</u> of sediment	2	
		(c)	Ores contain a large proportion of waste materials Large quantity of material to produce small quantities of product	1	Require high energy input to extract metal

Question		Expected Answer(s)	Max Mark	Additional Guidance
6.	(a)	Environmental advantage is that it is less polluting, less CO ₂ emissions, renewable source 1 Social disadvantage is that it requires land to grow crop which may be used for food crops 1	2	
	(b)	Fermentation	1	Anaerobic respiration
	(c)	(i)	1	
		(ii)	1	Any suitable
7.	(a)	Appropriate Scale and label with units X 1 Appropriate Scale and label with units Y 1 Points plotted and joined correctly 1	3	One zero acceptable on axis No double lines Over half graph paper used Line of best fit acceptable Half box tolerance
	(b)	As the angle of the blade is increased from 0 to 40 degrees the voltage produced increases 1 Once the blade angle exceeds 40 degrees the voltage produced decreases 1	2	Degrees to be stated Exceeds 40 degrees and decreased for the mark
	(c)	Size of fan, Distance fan from blades, material blades were made from, size of blades, shape of blades, wind speed, voltmeter	1	Any appropriate answer, as long as it affects the voltage produced. Not connectors
	(d)	Disagree No evidence of repeat results Experiment not repeated	1	Any appropriate answer which suggests no repeats of testing was carried out
	(e)	Habitats disrupted due to construction Possible disruption of bird migration paths Noise produced Road building for maintenance Visual Pollution	1	Any appropriate <u>Environmental</u> answer Not expensive
	(f)	Kinetic (movement) to electrical	1	

Question		Expected Answer(s)	Max Mark	Additional Guidance
8	(a)	Deforestation Fossil fuel combustion	1	Any appropriate answer
	(b)	0.0047, accept 0.005	1	
	(c)	decrease as plant plankton will absorb more carbon dioxide. 1 OR NONE - Plankton CO ₂ uptake is equal to CO ₂ output 1	2	One mark for prediction One mark for reason
	(d)	Scottish Environmental Protection Agency SEPA	1	
9	(a)	(i) Nuclear fuel produces less CO ₂ per kWh compared to coal. 1 Nuclear produces more energy 77 000 000 MJ energy per kg whereas coal produces 25 MJ per kg 1	2	
		(ii) 16.7% accept 17%	1	
	(b)	Park and ride Local rail Increase public transport Pedestrianisation Cycle lanes/city cars or other appropriate answer	1	One mark for suitable scheme
	(c)	Methane Water vapour	1	
	(d)	Damage to property or infrastructure Lost productivity as staff cannot attend work due to natural disasters eg flooding Lost crop yield due to flooding/new diseases Extended growing season Other appropriate answer	1	Any other acceptable answer

Question			Expected Answer(s)	Max Mark	Additional Guidance
10.	(a)	(i)	Irrigate crops Drinking water Washing dishes Transportation Producing hydroelectric power	1	Any other suitable answer
		(ii)	The river is polluted with raw sewage - drinking this causes sickness and diarrhoea	1	Pollution alone not accepted, must have reason as unsafe to drink
	(b)		Dig wells Purification Bottled water Distillation Provide education on hygiene Use sand or clay filters to clean water before drinking	1	Any one Any other correct answer
.	(c)		Religious events/fishing/cremations /drinking/industry/tourism	1	One mark for naming the two user groups
11.	(a)		Dived (caught) and raked Low impact on habitat Low impact on target species Low impact on non-target species	2	1 mark for method 1 mark for explanation
	(b)		licences, permits, conservation zones, protected areas, legislation, quotas, breeding programmes, aquaculture	1	Or any other suitable
	(c)		Advantage - creates employment in rural area, sheltered growing conditions, clean water supply, low pollution 1 Disadvantage - expensive for transporting, high emissions from transport 1	2	Or any other suitable. Only one advantage/disadvantage required.
	(d)		Any answer which implies an understanding of the concept of sustainability	1	

Question		Expected Answer(s)	Max Mark	Additional Guidance
12.	(a)	7-8	1	
	(b)	<p>Intensive farming Keeping animals indoors reduces energy loss to the environment so more energy is available for growth Crop rotation Monocultures</p> <p>GM Crops Crops can be genetically modified to be disease resistant to ensure crops don't fail.</p> <p>Agrochemicals Use herbicide to remove other plants apart from the crop ensures all the energy goes to the crop to create a bigger yield.</p>	2	1 for strategy 1 for appropriate description
	(c)	<p>Advantage - less harmful to the environment, less eutrophication, more insects, greater biodiversity, increased farming profit 1</p> <p>Disadvantage - lower yield, higher cost, more 1</p>	2	Any other acceptable answer

Question		Expected Answer(s)	Max Mark	Additional Guidance
13.	(a)	<p>Energy Conversion</p> <ul style="list-style-type: none"> • Photosynthesis is the conversion of light energy to chemical energy (1) • Carried out by plants/ autotrophs (1) • Chlorophyll absorbs light energy (1) • Only takes place during daylight hours (1) <p>Photosynthesis word equation (or description)</p> <p>Water/H₂O + Carbon dioxide/CO₂ + light → Glucose/C₆ H₁₂ O₆ + Oxygen/O₂</p> <p>Glucose/sugar/starch is a store of chemical energy (1)</p> <p>Importance of Photosynthesis to Primary Consumers</p> <ul style="list-style-type: none"> • Primary consumers feed on plants/autotrophs (1) • To gain chemical energy/sugar/starch (1) • Chemical energy/sugar/starch is used to generate energy by respiration (1) • Respiration word equation (or description) (1) <p>Glucose/C₆ H₁₂ O₆ + Oxygen/O₂ → Water/H₂O + Carbon dioxide/CO₂</p> <ul style="list-style-type: none"> • One example of type of energy converted by primary consumer, eg movement, heat, sound, chemical energy, etc (1) • Only about 10% of energy produced by the plant/ autotroph is available to be passed on to the primary consumer (1) • Oxygen generated during photosynthesis also available for use by primary consumers. (1) 	7	<p>Any 7</p> <p>Word equation acceptable</p>

Question		Expected Answer(s)	Max Mark	Additional Guidance
	(b)	<p>-Appropriate named ecosystem, eg (Caledonian) forest, heather moorland, machair, fresh water loch, sea water loch, river, etc</p> <p>-An ecosystem is a natural biological unit made of living and non-living parts</p> <p>-2 abiotic factors relevant to named ecosystem stated</p> <p>-The biodiversity is the variety of plants and animals found there</p> <p>-All the plants and animals together make up the community</p> <p>-At least 2 named examples of appropriate plants,</p> <p>-At least 2 named examples of appropriate animals</p> <p>-The number of each species is known as a population</p> <p>-Species are adapted to their surroundings</p> <p>-Named example and description of adaptation relevant to named ecosystem, eg heather plant is adapted to living in acidic soil, mountain hare goes white in winter time, etc</p>	7	Any 7

Question		Expected Answer(s)	Max Mark	Additional Guidance
14.	(a)	<p>A description of using less energy in the household</p> <ul style="list-style-type: none"> • Switching off lights, standby, boil only enough water • Double glazing, insulation, switch down thermostats <p>Any suitable</p> <p>A description of recycling</p> <ul style="list-style-type: none"> • Any examples, glass ,paper, tins, cardboard <p>A description of re-use</p> <ul style="list-style-type: none"> • Any example, reusing water bottles, plastic bags any suitable <p>A description of reducing packaging</p> <ul style="list-style-type: none"> • Reduce use of food packaging, present wrapping etc <p>A description of reducing travel costs</p> <ul style="list-style-type: none"> • Car sharing, public transport, cycling to work, 	7	Any 7 descriptions and appropriate explanations

Question	Expected Answer(s)	Max Mark	Additional Guidance
(b)	<p>Reducing the number of cars by:</p> <ul style="list-style-type: none"> • Park and ride schemes reduce traffic in city centres by encouraging people to leave their cars and use public transport. • Increase in city centre parking charges to encourage people to leave their cars (and use public transport). • Congestion charges to encourage people to leave their cars (and use public transport). • Provision of bicycles (or description of ‘Boris bikes’) to allow people to move within cities without the need for a car. • Provision of cycle tracks/walkways to allow people to move within cities without the need for a car. • Increased public transport to allow people to move within cities without the need for a car. • Create traffic-free zones/pedestrianised areas to keep cars away. <p>Improve technology by:</p> <ul style="list-style-type: none"> • Stop-start technology to reduce emissions when sitting in traffic jams • Electric/hybrid cars that rely on energy sources other than fossil fuels • Use of sat/nav type technology to forewarn of locations of traffic jams • Improved fuel technology with reduced emissions <p>Financial Incentive/penalty by:</p> <ul style="list-style-type: none"> • Reduced vehicle tax for small engine cars/converse Increase in city centre parking charges to encourage people to leave their cars (and use public transport). • Congestion charges to encourage people to leave their cars (and use public transport) 	7	Any 7 descriptions and appropriate explanations

[END OF MARKING INSTRUCTIONS]