



General Certificate of Secondary Education

Environmental Science 3441

3441/H

Mark Scheme

2008 examination – June series

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Higher Tier – 3441H

Question 1 3441H

Question 6 3441F

	answers	extra information	mark
(a)(i)	any two from	one mark for simple statement × 2	2
	noise which may cause disturbance / stress / loss of amenity	second for linked explanatory statement × 2	2
	visual impact may deter tourists / spoil landscape beauty	accept also possible risk to sufferers of epilepsy because of ‘stroboscopic’ visual disruption	
	risks to wildlife eg bird strike	do not credit reference to cost of construction etc except when subsidy is mentioned	
	local jealousy since some earn revenue from turbines while others do not		
	loss of amenity causes decline in house prices		
	disruption to TV signals by interference		
(a)(ii)	any one from further away from settlements (hence reduction of noise, visual impact etc) higher windspeeds / more wind		1
(a)(iii)	Quality of written communication correct linking of ideas as specified by one of the following paired statements		1
	any one from	one mark for simple statement	1
	wind power is a renewable resource therefore will not run out like fossil fuels / its use is sustainable	second for linked explanatory	1
	wind power does not emit carbon dioxide therefore does not add to greenhouse effect / climate change		

Question 1 (continued) 3441H

Question 6 (continued) 3441F

	answers	extra information	mark
	wind power does not emit sulphur dioxide therefore does not add to acid deposition / rain does not use fossil fuels therefore less impact of extraction / transport of fuel		
(b)(i)	photosynthesis		1
(b)(ii)	burning biofuels returns carbon dioxide but this has only recently removed from the atmosphere (by photosynthesis)	one mark for simple statement second for linked explanatory statement credit mention of contrast between this situation and combustion of fossil fuels accept CO ₂ will soon be removed from atmosphere again <u>by photosynthesis</u> MAX 1	1 1
Total			11

Question 2 3441H

Question 7 3441F

	answers	extra information	mark										
(a)(i)	any one from	one mark for simple statement	1										
	noise caused by machinery / blasting / transport / which may cause disturbance / stress / loss of amenity dust may cause breathing / eye problems or may dirty washing / cars / plants (lorry) transport may cause noise / hazard / congestion / dirty roads / vibration visual impact damages landscape/reduces amenity lower house values because of loss of amenity	second for linked descriptive statement	1										
(a)(ii)	<table border="1"> <thead> <tr> <th>Problem</th> <th>Strategy</th> </tr> </thead> <tbody> <tr> <td>Noise</td> <td>baffle mounds; limited working hours;</td> </tr> <tr> <td>Dust</td> <td>water spray; sheeted loads;</td> </tr> <tr> <td>Transport impacts</td> <td>dedicated routes; sheeted loads to avoid</td> </tr> <tr> <td>Visual impact</td> <td>screening</td> </tr> </tbody> </table>	Problem	Strategy	Noise	baffle mounds; limited working hours;	Dust	water spray; sheeted loads;	Transport impacts	dedicated routes; sheeted loads to avoid	Visual impact	screening	accept provision of <u>specified</u> soundproofing measure eg double glazing	1
Problem	Strategy												
Noise	baffle mounds; limited working hours;												
Dust	water spray; sheeted loads;												
Transport impacts	dedicated routes; sheeted loads to avoid												
Visual impact	screening												
(a)(iii)	any one from	one mark for simple statement	1										
	loss of wildlife habitat caused by excavation of quarry reduction in photosynthesis caused by dust on plants/removal of vegetation disturbance to wildlife caused by noise creation of new habitats eg cliff nest sites or other appropriate example	second for linked descriptive statement	1										

Question 2 (continued) 3441H

Question 7 (continued) 3441F

	answers	extra information	mark
(a)(iv)	any two from employment stimulus to (local) economy reduced need for imports gaining essential resources		2
(b)	any two from mortar building (stone) specified amenity use road stone/bulk fill iron and steel industry/glass manufacture/toothpaste/cosmetics/paper/bread agricultural use / adjust soil pH	do not accept concrete	2
(c)(i)	Environment Agency		1
(c)(ii)	Target 1: to reduce use of fossil fuels any one from reduce carbon dioxide emissions / reduce greenhouse gas emissions/global warming prolong life of fossil fuel resources reduce mining / drilling impacts Target 2: to increase energy from waste any one from reduce landfill demand make effective use of waste prolong life of fossil fuels (but not if already credited in Target 1)		1 1
Total			12

Question 3 3441H

Question 8 3441F

	answers	extra information	mark
(a)(i)	oxygen	one mark for simple statement	1
	decreases (rapidly)		
	from 20% to zero	second for linked descriptive statement	1
	methane		1
	increases (from zero) / increases only once oxygen declines to zero		1
	eventually stabilises / reaches approx 55%		
(a)(ii)	anaerobic respiration		1
(a)(iii)	requires anaerobic conditions / cannot be produced until oxygen is used up		1
(b)	reduces contribution to greenhouse effect	one mark for simple statement	1
	because burning one molecule of methane produces one molecule of carbon dioxide / because methane is 21 times more effective as a greenhouse gas than carbon dioxide	second for linked explanatory	1
(c)	any four from collect gas burn gas (boil water) to create steam steam turns turbine turbine turns generator	accept also burn gas, hot expanding gas turns turbine	4
Total			12

Question 4 3441H

Question 9 3441F

	answers	extra information	mark
(a)(i)	any two from cages restrict movement control of temperature control of food / water supply control of light / day length		2
(a)(ii)	any one from	one mark for simple statement	1
	cruel / animal rights objection because birds cannot move freely / are overcrowded / cannot express natural behaviour increased risk of disease because of close confinement / contact	second for linked explanatory statement	1
(a)(iii)	any one from	one mark for simple statement	1
	free range hens need more food because they use energy to move around / regulate temperature more land needed so birds can move around / have access to grass higher labour costs eg for feeding / egg collecting	second for linked explanatory statement	1
(b)	any three from use of greenhouse / glasshouses / polytunnels allows control of temperature / light / water supply / nutrients / carbon dioxide / easter pest control mention of relevant method of controlling named factor increases rate of photosynthesis		3
Total			9

Question 5 3441H

Question 10 3441F

	answers	extra information	mark
(a)(i)	because it is harmful / poisonous		1
(a)(ii)	statement is wrong	no mark for choice	
	because catalytic converters increase emissions of carbon dioxide / reduce fuel efficiency	one mark for simple statement	1
	hence increased greenhouse gas emissions	second for linked explanatory statement	1
	(must mention greenhouse for 2 nd mark)	accept statement inconclusive because of lack of data about the greenhouse potential of all gases involved	
(a)(iii)	photochemical smog		1
(a)(iv)	acid deposition / rain	one mark for simple statement	1
	which harms forests / buildings / aquatic life / may be a transboundary pollutant	second for linked descriptive statement	1
(b)	any two from	one mark for simple statement × 2	2
	congestion increases journey times causing stress / loss to economy	second for linked explanatory × 2	2
	congestion may hamper emergency vehicles putting lives at risk		
	congestion reduces fuel efficiency causing more air pollution		
	congestion charge encourages use of public transport/walking/reduces car use which reduces air pollution		
Total			10

Question 6 3441H

	answers	extra information	mark
(a)	<p>Quality of written communication</p> <p>correct use of scientific terms (organic matter; sediment; anaerobic; heat; pressure)</p> <p>any four from</p> <p>organic matter / dead plants and animals</p> <p>buried by sediment</p> <p>under anaerobic conditions</p> <p>altered by heat / pressure</p> <p>over long periods of time</p>	<p>award mark for correct use of two of the listed terms</p>	<p>1</p> <p>4</p>
(b)(i)	<p>any two from</p> <p>less oil available / used in future</p> <p>peak oil production around 2020</p> <p>need for increasing reliance on (named) renewables</p>	<p>accept 2015 – 2025</p>	<p>2</p>
(b)(iii)	<p>coal or natural gas</p> <p>tidal or wave</p> <p>nuclear</p>		<p>1</p> <p>1</p> <p>1</p>
(c)	<p>any one from</p> <p>fossil fuels will run out more quickly leaving insufficient resources for future generations</p> <p>burning fossil fuels creates air pollution / specified form of air pollution</p> <p>creating problems for future generations</p>	<p>one mark for simple statement</p> <p>second for linked explanatory statement</p> <p>mention of future generations essential for second mark</p>	<p>1</p> <p>1</p>
Total			12

Question 7 3441H

	answers	extra information	mark
(a)(i)	to ensure that a sample is completely dry		1
(a)(ii)	20%		1
(b)(i)	any one from	one mark for simple statement	1
	both fields on same farm so similar climate	second for linked explanatory statement	1
	twenty samples enough for a representative sample / enough to reduce effect of anomalies		
	all samples collected in short time span / on same day / with fine weather throughout so both soil types will have received same amount of rainfall		
(b)(ii)	any two from	one mark for simple statement × 2	2
	random sample locations to avoid bias	second for linked explanatory statement × 2	2
	samples from same depth since soil moisture content may vary with depth		
	cleaning of equipment between samples to avoid contamination of subsequent sample		
	sealing in plastic bags to avoid drying out en route to laboratory		
	careful labelling of samples to avoid confusion between samples / need to discard samples		
(b)(iii)	field B is more likely to have clay soil	no mark for choice of field	
	clay soils usually have higher soil moisture content	one mark for simple statement	1
	because smaller particle size (and therefore pore size) / impeded drainage	second for linked explanatory	1

Question 7 (continued) 3441H

	answers	extra information	mark
(b)(iv)	<p>either (hand texturing method) moisten soil sample attempt to form cube, thread, etc compare attributes of sample with published descriptions</p> <p>or (soil sieves) pass soil sample through sieves of different mesh sizes weigh amount caught in each sieve calculate percentages of sand, silt and clay / different particles sizes</p> <p>or (simple settlement method) shake with water allow to settle measure thickness of layers</p>	Accept appropriate description of use of soil hydrometer	3
Total			13

Question 8 3441H

	answers	extra information	mark
(a)(i)	amount of carbon dioxide in atmosphere is increasing	one mark for simple statement	1
	because total input to atmosphere (758 billion tonnes per year) exceeds total removed from atmosphere (746 billion tonnes per year)	second for linked explanatory reference to data	1
(a)(ii)	any one from animal / bacterial / soil respiration fossil fuel formation limestone formation / decomposition forest fires volcanoes digestion decay of animals		1
(a)(iii)	any one from plants / trees seas and oceans		1
(a)(iv)	less carbon dioxide being removed from atmosphere by photosynthesis		1
	carbon dioxide will be returned to the atmosphere when trees are burnt or decompose		1
(b)(i)	carbon dioxide is a greenhouse gas		1
	which allows shortwave radiation from the sun to pass through		1
	but which absorbs out-going long wavelength radiation		1
	thus causing warming of the atmosphere (which intensifies weather events)		1

Question 8 (continued) 3441H

	answers	extra information	mark
(b)(ii)	seas and oceans currently act as a carbon sink / absorb more carbon dioxide than they return to the atmosphere		1
	but if seas get warmer they may not be able to hold as much carbon dioxide		1
	more carbon dioxide will remain in the atmosphere		1
	adding to the greenhouse effect		1
(b)(iii)	any one from	one mark for simple statement	1
	tree planting not a large enough carbon sink to absorb all the extra carbon OWTTE	second for linked explanatory statement	1
	because more carbon is released by burning fossil fuels than is taken out by vegetation	credit 1 mark for specific accurate reference to data	
	Tree planting not a long term solution because much of the carbon dioxide is returned to the atmosphere when wood decays/is burnt		
Total			16

Question 9 3441H

	answers	extra information	mark
(a)(i)	decrease in ozone 1980 – mid 1990s	one mark for simple statement	1
	caused by ozone depleting substances / CFCs or other valid example	second for linked explanatory statement	1
	levelling off after mid 1990s		1
	as result of Montreal Protocol	Montreal Protocol must be named for fourth mark	1
(a)(ii)	3 atom molecule of oxygen / O ₃		1
(b)(i)	ultraviolet radiation	accept UV B but not UV A	1
(b)(ii)	damages human health	one mark for simple statement	1
	by causing skin cancer / cataracts / blindness / damage to eyesight	second for linked explanatory statement	1
	may damage plants		1
	may cause damage to ecosystems / human food supplies	accept implied damage to health and credit 1 mark for each example (skin cancer and cataracts)	1
Total			10

Question 10 3441H

	answers	extra information	mark
(a)(i)	weeds reduce crop yields	one mark for simple statement	1
	by taking / competing for light / water / nutrients	second for linked explanatory statement	1
(a)(ii)	any one from saves worker's time saves tractor fuel saves expenditure on herbicides		1
(a)(iii)	allows crops to be planted without ploughing	one mark for simple statement	1
	so soil is protected by remains of previous crop / soil is not exposed to wind / run-off	second for linked explanatory	1
(a)(iv)	GM (usually) involves transfer of genes from one species to another		1
	selective breeding only operates within species / involves in-breeding (for desired characteristics)		1

Question 10 (continued) 3441H

(b)	mechanisation involving use of machines to perform tasks formerly done by human labour / increasing size of machines / reference to specific example	one mark for simple statement second for linked descriptive statement	1 1
	use of fertilisers to replace nutrients / increase yield	allow up to two descriptive details per method for up to two methods – hence minimum of three methods stated and described for full marks	1 1
	use of pesticides / herbicides, etc to kill harmful organisms which damage / compete with crops		1 1
	use of controlled environments eg animal housing / greenhouse / reference to valid example / reference to control of animal movement or specified environmental parameter		1 1
	use of irrigation to provide sufficient water for crop growth		
	veterinary medicines to combat disease		
	hedgerow removal increases crop area		
	Total		15