

GCSE 2004
June Series



Mark Scheme

Environmental Science – Foundation (3441)

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

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Dr Michael Cresswell Director General

Foundation Tier 3441F**Question 1 3441F**

	answers	extra information	mark
a	chemical kinetic generator	turbine electrical	5
b(i)	natural gas		1
(ii)	96.5		1
(iii)	98.8		1
c(i)	Any two from renewable/does not use fuel resources does not emit carbon dioxide/does not contribute to enhanced greenhouse effect/global climatic change does not emit sulphur dioxide/oxides of nitrogen/does not add to acid deposition	accept does not cause (air/water) pollution do not accept 'cheaper'	2
(ii)	Any two from noise visual impact risk to wildlife/habitat loss disturbance to TV signals unreliable resource		2
(iii)	Any two from tidal wave solar geothermal biofuels/biomass/specified biofuel HEP		2
Total			14

Question 2 3441F

	answers	extra information	mark
a(i)	1 mark per correctly plotted bar	(must use ruler – max = 1 mark of total if freehand)	1 1
(ii)	8.2		1
(iii)	2.6		1
b(i)	leaving crop residue protects soil from wind/rain or organic matter/crop residue improves soil structure so that soil is less easily eroded	1 mark for simple statement; second mark for appropriate amplification	2
(ii)	helps wildlife/reduces fuel use/reduces evaporation of water		1
c	<i>Quality of Written Communication</i> <i>Correct use of scientific terms (control)</i> Any four from use of control OWTTE use some form of sampling control must have same soil type same climate/specified aspect of climate same slope/aspect must grow same crop must be cultivated in the same way		1 4
Total			12

Question 3 3441F

	answers	extra information	mark								
a(i)	<table border="1"> <tr> <td>Putrefying bacteria</td> <td></td> </tr> <tr> <td>Denitrifying bacteria</td> <td>A</td> </tr> <tr> <td>Nitrifying bacteria</td> <td>C</td> </tr> <tr> <td>Nitrogen fixing bacteria</td> <td>D</td> </tr> </table>	Putrefying bacteria		Denitrifying bacteria	A	Nitrifying bacteria	C	Nitrogen fixing bacteria	D		3
Putrefying bacteria											
Denitrifying bacteria	A										
Nitrifying bacteria	C										
Nitrogen fixing bacteria	D										
(ii)	they break down/decompose animal waste/organic matter/recycle nutrients		1								
(iii)	lightning		1								
b(i)	to replace nutrients removed in crops/livestock/by leaching	allow 'increase crop yields' (1 mark only)	1 1								
(ii)	growing leguminous crops adding manure/allow animals on land	accept named example of crop	1 1								
c(i)	Effect causes/feared to cause blue baby syndrome/digestive tract cancers		1								
	Explanation by contamination of aquifers/drinking water supplies		1								
(ii)	Effect eutrophication/deoxygenation of water		1								
	Organism fish/appropriate invertebrate indicator organism		1								
	or										
	Effect loss of biodiversity										
	Organism plants										
Total			13								

Question 4 3441F

	answers	extra information	mark
a(i)	Any one of Change loss of hedgerows/ enlarged fields Reason easier to use machinery/reduced maintenance cost/gain in productive land/removal of pest habitat Change removal of ponds Reason gain in productive land/no longer needed for livestock Change reduction in pasture Reason land/increase in arable specialisation in UK farming/arable more profitable	reason must match change allow 'make more space' if suitably explained	2
(ii)	loss of wildlife habitats/threat to named species		1
	damage to landscape OWTTE		1
b(i)	Common Agricultural Policy		1
(ii)	farmers were given guaranteed prices		1
	therefore no incentive to limit production (OWTTE)		1
(iii)	setaside farmers were paid to take land out of use (milk) quotas limits placed on amount which farmers could sell	1 mark for simple statement/naming of policy measure, second for relevant explanation	4

continued

Question 4 (continued) 3441F

	answers	extra information	mark
c	Any three of farming without use of chemicals use of biological pest control use of manure or leguminous crops to maintain soil fertility use of crop rotation no use of GMO more stringent animal welfare provisions no/controlled use of veterinary medicines/antibiotics/growth promoters		3
Total			14

Question 5 3441F

	answers	extra information	mark
a(i)	2.55 – 2.6		1
(ii)	points correctly plotted		1
	curve completed, passing through points		1
(iii)	target is likely to be met	credit appropriate reference to figures or extended graph	1
	if recent trend continues		1
	emissions in 2010 will be below target		1
(iv)	Any one from catalytic converters low NO _x boilers increased use of renewables use of electric vehicles		1
b(i)	Any two from flue gas desulphurisation removes sulphur dioxide from exhaust gases (of power stations) burning low sulphur fuel or switching to gas therefore lower emissions of sulphur dioxide increased use of renewable energy resources or nuclear which emit no sulphur dioxide/instead of fossil fuels reduced private vehicle use therefore less SO ₂ emitted from transport	one mark for simple statement of change, second for relevant amplification accept FGD/filters/absorption	2 2

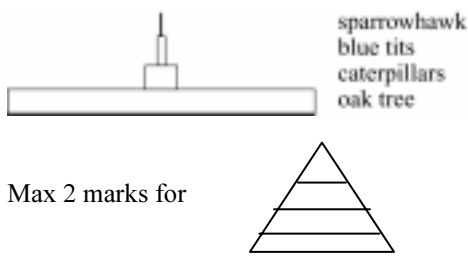
continued

Question 5 (continued) 3441F

(ii)	Any two from damage to lichens forest/plant death/damage damage to fish/aquatic life acidification of soils/water bodies	2
Total		13

Question 6 3441F

Question 1 3441H

	answers	extra information	mark
a(i)	sun		1
(ii)	badgers, weasels, owls	any two must be correct for one mark	1
(iii)	increase in blue tits decrease in moth caterpillars or aphids		1 1
b(i)	oak tree widest bar symmetrical about centre line correctly labelled	 <p>Max 2 marks for</p>	1 1 1
(ii)	weasels and owls are at higher trophic level/further along food chains limited amounts of energy passed from one trophic level to the next therefore insufficient energy to support larger numbers of weasels and owls		3
Total			10

Question 7 3441F

Question 2 3441H

	answers	extra information	mark
a(i)	nitrogen		1
	oxygen		1
	carbon dioxide		1
(ii)	respiration		1
	forms the ozone layer		1
b(i)	more carbon dioxide (middle box ticked)		1
(ii)	Earth needed to retain more heat to maintain similar temperatures to today therefore more carbon dioxide needed to provide a stronger greenhouse effect (OWTTE)	1 mark for simple statement, second for linked explanation if top box ticked max 1 mark for explanation in terms of increased fossil fuel use or decreased tree cover	2
Total			8

Question 8 3441F

Question 3 3441H

	answers	extra information	mark
a(i)	limestone/chalk		1
(ii)	Any two from agricultural lime paths/drives building stone statues/gravestones road stone pharmaceuticals iron & steel making glass manufacture	accept appropriate uses for incorrect rocks from a (i)	2
b(i)	<i>Quality of Written Communication</i> <i>Correct linking of ideas (in favour of closure and valid reasons; against closure and valid reasons)</i>		1
	In favour of closure maximum of three from noise dust eyesore transport impacts (risk of further) habitat or farmland loss	maximum of 3 marks for either side of argument	
	Against closure maximum of three from loss of employment or income from quarry consequent economic effects in local community quarry provides essential resource		4

continued

Question 8 (continued) 3441F

Question 3 3441H

	answers	extra information	mark
(ii)	Any one from	1 appropriate use	1
	landfill site	second for suitable action	1
	clear site/create impermeable lining (unless inert waste only)		
	industrial heritage museum retain existing structures/provide specified visitor provision		
	redevelop for other industry clear site/landscape/build new factory units		
	appropriate recreational/nature conservation use (not water based) clear site/landscape/visitor provision	credit obtaining planning permission for appropriate use	
Total			10

Question 9 3441F

Question 4 3441H

	answers	extra information	mark
a(i)	initial rise		1
	followed by decline		1
	or		
	overall decline		
	with fluctuations		
(ii)	Any four from		4
	cod/total weight of cod able to breed has fallen below the sustainable level		
	and is still falling		
	cod are being caught faster than they can breed		
	if this trend continues cod will become extinct in the North Sea		
	with catastrophic results for the fishing industry		
b(i)	Any one from		1
	refusal to accept evidence of decline of stock		
	(fear of) loss of employment or income		
(ii)	use of nets with larger mesh size		1
	allows smaller fish to escape		1
	and mature to breeding size/age OWTTE		1
Total			10

Question 10 3441F

Question 5 3441H

	answers	extra information	mark
a(i)	<p>catch samples of aquatic life</p> <p>identify (and count) organisms found</p> <p>different organisms have different levels of tolerance of pollution</p> <p>responding primarily to levels of dissolved oxygen</p> <p>credit specific example of type of organism correctly linked to qualitative description of level of pollution</p> <p>compare species found with published descriptions</p>	<p>maximum 2 marks for disjointed statements. Linked explanation needed for higher marks.</p>	4
(ii)	<p>they need a second site as control/as basis for comparison</p> <p>this site must be upstream of the sewage works</p>		1 1
(iii)	<p>Any two from</p> <p>organic matter/untreated sewage/human waste</p> <p>(plant) nutrients</p> <p>chemicals</p>	<p>accept specified nutrients for 2 marks</p>	2
b(i)	<p>Official licence/permission to discharge</p> <p>specified amounts of effluent</p>		1 1
(ii)	<p>Environment Agency</p>		1
c(i)	<p>cooling tower</p>		1
(ii)	<p>water/steam</p>		1

continued

Question 10 (continued) 3441F

Question 5 3441H

	answers	extra information	mark
(iii)	tower cools water from power station before discharge/return to river allowing water to contain more dissolved oxygen which is needed by (most) aquatic organisms	maximum 2 marks for disjointed statements. Linked explanation needed for higher marks.	3
Total			16