



General Certificate of Education

Environmental Science 3441

3441/F

Mark Scheme

2006 examination – June series

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.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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

	answers	extra information	mark								
a(i)	nitrogen carbon dioxide oxygen		3								
(ii)	0.965		1								
(iii)	1. nitrogen 2. carbon dioxide 3. oxygen		3								
b(i)	<table border="1"> <tbody> <tr> <td>A</td> <td>evaporation</td> </tr> <tr> <td>E</td> <td>infiltration</td> </tr> <tr> <td>C</td> <td>precipitation</td> </tr> <tr> <td>D</td> <td>run-off</td> </tr> </tbody> </table>	A	evaporation	E	infiltration	C	precipitation	D	run-off		4
A	evaporation										
E	infiltration										
C	precipitation										
D	run-off										
(ii)	1. precipitation 2. evaporation 3. run-off	accept letter codes from table in (b)(i) accept transpiration/evapotranspiration	3								
Total			14								

Question 2 3441F

	answers	extra information	mark
a(i)	600 000 000 tonnes		1
(ii)	tick bottom box (impossible to tell) some of the 32.3 % who did not say they were against the quarry may have been “don’t knows” OWTTE		1 1
(iii)	any two from employment extra income winning vital resource	accept improved infrastructure, improved facilities after quarrying or specific eg s of these	1 1
(iv)	any one from authors / sponsors of survey because of risk of bias exact wording of questions as this may influence responses size / method of choosing sample as sample may or may not be representative	1 mark for appropriate piece of information and 1 mark for reason.	1 1

continued

Question 2 (continued) 3441F

	answers	extra information	mark
b	any three from	1 mark for stated impact	
	dust water spray / wheel washers / sheeted loads	1 mark for appropriate method to reduce problem	2
	visual impact / damage to scenery screening		2
	noise screening / limited hours of work		2
	habitat loss careful prior survey / restoration of site to provide habitats		
	traffic problems build roads / careful route choice / speed limits		
	danger fences		
Total			13

Question 3 3441F

	answers	extra information	mark
a(i)	<div style="border: 1px solid black; display: inline-block; padding: 2px 10px;">oxygen</div>		3
	<div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="border: 1px solid black; display: inline-block; padding: 2px 10px;">carbon dioxide</div> <div style="border: 1px solid black; display: inline-block; padding: 2px 10px;">water</div> </div>		
(ii)	<p>tick 2nd and 4th boxes</p> <p>plants respire and carry out photosynthesis</p> <p>some organisms can respire without oxygen.</p>		1 1
b(i)	10%		1
(ii)	<p>any one from</p> <p>used (in respiration) by cow</p> <p>lost in waste</p> <p>not all of cow is edible</p>		1
(iii)	<p>if humans eat cow they receive only 10 units of energy (out of the 1000 trapped by the plants)</p> <p>but if humans ate plants they would receive 100 units of energy / ten times as much</p> <p>OWTTE</p>	<p>accept ‘small proportion of energy’</p> <p>accept ‘large proportion of energy’</p>	1 1

continued

Question 3 (continued) 3441F

	answers	extra information	mark
(iv)	any one from farmers need to feed animals less / animals gain more weight because animals waste less energy moving around / keeping warm	accept may catch diseases outside leading to cull / unfit meat	1 1
Total			11

Question 4 3441F

	answers	extra information	mark
a(i)	mechanisation		1
(ii)	any one from enclosed cab / less manual effort therefore better working conditions faster completion of work therefore takes advantage of spells of good weather / reduced labour costs	one mark for simple statement second for linked explanatory statement	2
(iii)	reduction in hedgerows because large machines need larger fields (to work efficiently) OWTTE	one mark for simple statement second for linked explanatory statement accept large machinery enables hedgerow removals	2
b(i)	any two from particles further apart in A more air in A less water in A more space for root growth in A A less compacted	accept all converse statements related to B	2
(ii)	Quality of written communication correct use of one of the following scientific terms (compaction; infiltration) tractor has caused compaction of soil (along wheel tracks) OWTTE thus reducing infiltration of water OWTTE		1 1 1

continued

Question 4 (continued) 3441F

	answers	extra information	mark
c	any two from needs to take readings before work is undertaken / from uncultivated field / cultivated using old tractor to act as a control / basis for comparison should specify how sample locations are to be chosen (eg random) to avoid bias / ensure sampling of wheel tracks and other areas needs more replicates as three is too few to be reliable	one mark for simple statement second for linked explanatory statement	4
Total			14

Question 5 3441F

	answers	extra information	mark
a(i)	plastics 7%		1
(ii)	correct plotting		1
	labels		1
b(i)	11%		1
(ii)	any one from Ireland Greece		1
(iii)	Austria		1
c(i)	advantage cheap disposal option / easy disposal / quick disposal		1
	less air pollution than incineration		1
	use of landfill gas for energy production		
	disadvantage – any one from		
	waste of resources		
	litter		
	vermin		
	leachate		
	land take		
	smell		
risks of trespass			
eyesore			
methane production			

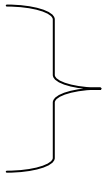
Question 5 (continued) 3441F

	answers	extra information	mark
(ii)	<p>advantage – any one from</p> <p>reduced need for landfill / reduced volume of waste</p> <p>energy recovery</p> <p>disadvantage – any one from</p> <p>waste of resources / loss of recyclable materials</p> <p>air pollution</p>		<p>1</p> <p>1</p>
d(i)	2.226 billion	accept 2.23 / 2.2 billion	1
(ii)	<p>1. it reduces resource use / pollution caused by energy generation</p> <p>2. reduced mining impacts</p> <p>3. reduced need for landfill / disposal of waste</p>		<p>1</p> <p>1</p> <p>1</p>
Total			14

continued

Question 6 3441F

Question 1 3441H

	answers	extra information	mark
a	cooler climate		1
	(up to) 950 mm of rain per year	accept 'higher rainfall'	1
b	any two from	one mark for simple statement	2
	hotter climate therefore more evaporation and / or transpiration	second for linked explanatory statement	
	as little as 250 ml of rain per annum therefore smaller supply of water	accept 'little rainfall'	2
	resorts / tourism creates increased demand agriculture created increased demand	 accept specific eg of demand for 4 marks at least one specific eg of demand required	
c	dams along river would withhold silt supply	one mark for simple statement	1
	so delta would be eroded away by sea	second for linked explanatory statement	1
	diverting water would reduce river flow	allow a third mark for a different linked explanatory statement	1
	so cutting off fresh water supply to marshes / habitat / organisms		1
	construction of dams / pipelines / canals damages / destroys habitats / prevents migration of fish		
d	any two from		2
	grey water recycling showers hippos (displacement device in cistern) rainwater harvesting	accept other valid suggestions	
Total			12

Question 7 3441F

Question 2 3441H

	answers	extra information	mark
a(i)	decreases		1
(ii)	increases		1
(iii)	92		1
b(i)	<p>Quality of written communication Correct linking of ideas as specified by one of the following paired statements</p> <p>advantage exclusion of sheep / cessation of grazing allows young trees to grow therefore allowing replacement of old trees (natural regeneration) / increased biodiversity / increases in blue tits</p> <p>disadvantage exclusion of sheep / cessation of grazing allows shrub layer to develop therefore reducing population of pied flycatchers</p>	<p>one mark for simple statement</p> <p>second for linked explanatory statement</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>
(ii)	Site of Special Scientific Interest		1
Total			9

Question 8 3441F

Question 3 3441H

	answers	extra information	mark
a(i)	fish → otter	must have both organisms for 1 mark	1
(ii)	poisoned by Dieldrin / pesticides		1
(iii)	Dieldrin is persistent / not broken down by organisms / not excreted		1
	therefore concentrated in organisms (higher up the food chain)	credit mention of biomagnification / bioaccumulation	1
b(i)	otters / signs of otters increasing (in all regions)		1
(ii)	non persistent pesticides are broken down in organisms so do not accumulate in organisms	one mark for simple statement	1
	therefore do not poison otters	second for linked explanatory statement	1

continued

Question 8 (continued) 3441F**Question 3 (continued) 3441H**

	answers	extra information	mark
c(i)	risks to human health / contamination of food / water		1
(ii)	organic farming		1
(iii)	any one from	one mark for simple statement	1
	biological control which uses predators to control prey species	second for linked additional detail	1
	use of crop / livestock rotation to prevent build-up of pests / diseases		
	release of sterile males so most matings are unproductive		
	use of naturally occurring pesticides eg derris, pyrethrum etc		
	use of GMO so that crop kills pest or specified eg		
Total			11

Question 9 3441F

Question 4 3441H

	answers	extra information	mark
a	heat kinetic electrical	accept thermal	3
b	any two from no fuel use therefore renewable / therefore no mining impacts no carbon dioxide emissions therefore no contribution to greenhouse effect no sulphur dioxide / oxides of nitrogen therefore no contribution to acid deposition renewable therefore does not deplete resources / run out	one mark for simple statement second for linked explanatory statement accept 'no pollution' for 1 mark	1 1 1 1

continued

Question 9 (continued) 3441F

Question 4 (continued) 3441H

	answers	extra information	mark
c(i)	questionnaire (survey)	accept survey of people	1
(ii)	fair test measures any two from carefully-designed questions so that respondents are not led to particular responses adequate sample size / sample different ages / social economic group so sample is representative OWTTE need for interviews in area further from windfarm to act as control / basis for comparison. replicate studies on different windfarms to determine whether findings have general application same questionnaire to all respondents to ensure comparability	one mark for simple statement	1
		second for linked explanatory statement	1
			1
			1
Total			12

Question 10 3441F

Question 5 3441H

	answers	extra information	mark
a(i)	any two from seepage from sea bed pipeline breaches oil rig accidents illegal dumping tank washing loading / unloading spills discharge from land		2
(ii)	any one from coats feather / fur reduces water proofing / toxic contamination of seabirds by floating oil toxic by ingestion damage to sea-bed organisms by oil sinking to bottom oil washed up on beaches can contaminate seaweeds / poison land animals which feed on beach damages to specified organisms causes harm higher in food chain	one mark for simple statement second for linked additional detail accept damage to specified organism by any reasonable mechanism	1 1
(iii)	any one from contamination of water / beaches may deter tourists contamination of fisheries reduces value of catch / prevents fishing	one mark for simple statement second for linked additional detail	1 1

continued

Question 10 (continued) 3441F**Question 5 (continued) 3441H**

	answers	extra information	mark
b(i)	any one from	one mark for simple statement	1
	burning of oil floating on surface	second for linked additional detail	1
	skimmers / OWTTE pick up oil from surface of the sea	credit mention of separation of oil from sea water	
	dispersants break up slick so oil sinks rather than floating on to shorelines	accept absorption of floating oil by straw etc	
	bioremediation bacteria are encouraged to ‘feed on’ oil		
(ii)	any one from	one mark for simple statement	1
	double-hulled tankers making them less likely to be breached in groundings / collisions	second for linked additional detail	1
	careful routeing of tankers to avoid likelihood of collision		
	training crews in health and safety		
	regular checks / maintenance to ensure tanker / pipeline safety		
	construction of pipeline to avoid need for tankers		
Total			10