



General Certificate of Secondary Education

Environmental Science 3441

3441/F

Mark Scheme

2008 examination – June series

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

	answers	extra information	mark
(a)(i)	precipitation		1
(a)(ii)	interception		1
(a)(iii)	evaporation		1
(a)(iv)	infiltration		1
(b)(i)	March 2006		1
(b)(ii)	1		1
(b)(iii)	need to conserve water	one mark for simple statement	1
	because rainfall below average in recent months	second for linked explanatory statement	1
(c)(i)	any one from secure water supply recreation / tourism / nature conservation use of reservoir employment during construction		1
(c)(ii)	any two from loss of farm land loss / damage to habitats visual impact loss of homes sterilization of land for future building development		2
(d)(i)	160 litres per person per day	accept 159 – 161	1
(d)(ii)	device to measure amount of water used		1

continued

Question 1 (continued) 3441F

	answers	extra information	mark
(d)(iii)	any one from household with meters pay for what they use OWTTE households with meters will use less to pay less	accept increased awareness of water use leads to reduction in use (not cost related)	1
(d)(iv)	any one from showers not baths dual flash loo / economical flushing cistern hippos	accept any feasible suggestions	1
Total			15

Question 2 3441F

	answers	extra information	mark
(a)(i)	(erosion by) water		1
(a)(ii)	2.77		1
(a)(iii)	any two from overall decrease in soil erosion rate of decrease slows erosion by wind decreases more	credit 1 mark for valid reference to data values	2
(b)(i)	terracing		1
(b)(ii)	terraces have flat soil surface	one mark for simple statement	1
	therefore increased infiltration / reduced run-off (OWTTE)	second for linked explanatory statement accept retention of soil by walls for 1 mark	1
(b)(iii)	any one from	one mark for simple statement	1
	trees increase interception therefore reducing raindrop impact / runoff	second for linked explanatory statement accept binding action of roots for 1 mark	1
	leaf fall adds humus therefore improves soil structure	accept answers based on prevention of wind erosion but do not allow duplication of marks in 2 (c) (i)	
(c)(i)	shelter belt slows wind speed OWTTE	one mark for simple statement	1
	therefore reducing energy available to erode soil particles OWTTE	second for linked explanatory statement	1

Question 2 (continued) 3441F

(c)(ii)	<p>any one from</p> <p>measure on a field with no shelter belt to act as a control / basis for comparison</p> <p>replicates to avoid undue emphasis on anomalies /to allow calculation of average rates</p> <p>standard distance from shelter belt to trap because this will influence amount of dust trapped</p> <p>same height/thickness/species of shelter belt tree to allow fair comparison</p> <p>calculation of mean reduction or % reduction in windspeed because initial windspeeds may vary</p>	<p>one mark for simple statement</p> <p>second for linked explanatory statement</p>	<p>1</p> <p>1</p>
(c)(iii)	<p>any two from</p> <p>strip cropping</p> <p>hedgerows</p> <p>no-till cropping</p> <p>planting green manure / cover crops</p>		<p>2</p>
Total			15

Question 3 3441F

	answers	extra information	mark
(a)	phosphorus		1
	potassium		1
(b)(i)	1 roots		1
	2 nitrogen		1
	3 nitrifying		1
	4 denitrifying		1
(b)(ii)	Quality of written communication		
	correct use of scientific terms (nitrogen-fixing; nodules; nitrates; nitrogen compounds; nutrient(s))	award mark for correct use of two of the listed terms	1
	clover has nitrogen fixing bacteria (in root nodules)	one mark for simple statement	1
	and so is not dependent on fertiliser for nitrates / nitrogen compounds / nitrogen as a nutrient	second for linked explanatory statement	1
(c)(i)	use of fertiliser		1
(c)(ii)	210		1
(c)(iii)	40%	allow correct calculation using incorrect answer from (c)(ii)	1
(c)(iv)	any one from animal wastes OWTTE lightning decay of organic matter		1
Total			13

Question 4 3441F

	answers	extra information	mark
(a)(i)	month - June		1
(a)(ii)	26 organisms per cm ²	accept answers in range 25-27	1
(a)(iii)	pest population grows (rapidly)	accept fluctuating population	1
	declines (sharply) whenever pesticide is applied		1
(a)(iv)	any one from pesticide residues on food may pose risks to human health pesticides may cause damage to wildlife / biodiversity may kill non-target species		1
(a)(v)	organic		1
(b)(i)	5 per 5 cm ²	accept 4-6	1
(b)(ii)	any two from pest and predator populations both low pest population does not fluctuate greatly / neither population fluctuates greatly pest population (density) usually greater than predator population		2
(b)(iii)	the use of a natural predator	one mark for simple statement	1
	to control the population of a pest / rather than use of chemical pesticides / valid example other than spider mite control	second for linked explanatory statement	1
(b)(ii)	pests needed to maintain predator population OWTTE	accept pests may be pollinators	1
Total			12

Question 5 3441F

	answers	extra information	mark
(a)(i)	thermal pollution / discharge of warm water		1
(a)(ii)	X upstream of power station (ie close to top of map)		1
(a)(iii)	any one from sample must be taken before the river reaches the power station to be sure that pollution was not coming from further upstream need for a control site		1
(a)(iv)	organic decomposition sewage		1 1 1
(b)(i)	rat-tailed maggot		1
(b)(ii)	rat-tailed maggot obtains air from atmosphere not water/has breathing tube therefore not affected by low oxygen concentrations found in the polluted stretch of the river	one mark for simple statement second for linked explanatory statement accept answers explaining why mayfly was not chosen	1 1

Question 5 (continued) 3441F

(b)(iii)			one mark for risk	1
	Risk	Precaution		
	Drowning/ falling in river	work in shallow water; adult supervision; use of safety lines;	second for appropriate safety precaution	1
	Biohazard (eg Weil's disease)	no eating / drinking during work; wash hands (before handling food); cover open wounds before starting; wear <u>waterproof</u> gloves		
	Slippery rocks	suitable footwear		
Total				11

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		
	wind power does not emit sulphur dioxide therefore does not add to acid deposition / rain		

Question 6 (continued) 3441F

	answers	extra information	mark
	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</u> <u>photosynthesis</u> MAX 1	1 1
Total			11

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 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 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 cruel / animal rights objection because birds cannot move freely / are overcrowded / cannot express natural behaviour increased risk of disease because of close confinement / contact	one mark for simple statement second for linked explanatory statement	1 1
(a)(iii)	any one from 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	one mark for simple statement second for linked explanatory statement	1 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 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 (must mention greenhouse for 2 nd mark)	second for linked explanatory statement accept statement inconclusive because of lack of data about the greenhouse potential of all gases involved	1
(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