



General Certificate of Secondary Education

Environmental Science 3441

3441/H

Mark Scheme

2007 examination – June series

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Higher Tier – 3441H**Question 1 3441 H****Question 6 3441F**

	answers	extra information	mark
a	A = filtration		1
	B = chlorination/disinfection	accept sterilisation	1
b(i)	aquifer		1
b(ii)	any one from	one mark for process	1
	screening because large objects cannot enter aquifer sedimentation/filtration because water already filtered through rock	second mark for valid reason	1
(iii)	Quality of Written Communication	award mark for appropriate use of any of these words	1
	correct use of scientific terms (recharge area, precipitation, aquifer, leach, infiltration, percolation, contamination, blue baby syndrome)		1
	this is recharge area for the aquifer – precipitation in this area infiltrates the permeable rock and could therefore carry nitrates into the aquifer, causing contamination of drinking water supplies (possibly leading to blue baby syndrome)		1
(iv)	most against Site X		1
	because it is in recharge area/contamination here will enter aquifer OWTTE		1
Total			10

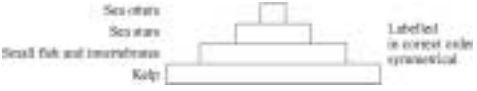
Question 2 3441H

Question 7 3441 F

	answers	extra information	mark
a(i)	one mark per bar correctly plotted	$\pm \frac{1}{2}$ small square	2
(ii)	2.5 million tonnes		1
(iii)	any one from specified amenity use bulk fill filter beds foundry sand glass making	accept tarmac	1
b	any two from mainly off east coast mainly within approx 25 km of coast small areas off south coast small areas off west coast	accept sandbanks accept close to coast/in shallow water do not accept reference to offshore islands	2
c(i)	less sand and gravel to help beaches build up naturally hence more risk of storm damage damage to marine habitats leads to either problems for fishing industry or less food for seals, etc		1 1 1 1
(ii)	any two from loss of amenity noise visual dust traffic impact loss of farm land habitat loss affects local house prices		2
Total			12

Question 3 3441 H

Question 8 3441F

	answers	extra information	mark
a(i)	food web		1
(ii)	any one from Sea Urchins small fish invertebrates		1
(iii)	Sun		1
b(i)		labelled in correct order tapers upward symmetrical stepped pyramid	1 1 1
(ii)	pyramid of energy		1
c(i)	killed/eaten by Orcas/killer whales	do not accept simply 'because of increase in Orcas'	1
(ii)	(decrease in Sea Otters causes) increase in Sea Urchins which feed on kelp		1 1
Total			10

Question 4 3441H

Question 9 3441 F

	answers	extra information	mark
(a)(i)	many people think veteran trees are beautiful		1
a(ii)	any one from owls etc nest bats give birth beetles and other insects oak native to UK		1
(iii)	tourist attraction		1
b(i)	slow increase rapid increase then levels off from 200 – 400 years	accept 'increase' for 1 mark accept 'no wood in first 50 years' for 1 mark	1 1 1
(ii)	trees have reached point where growth levels off/slows down therefore more profitable to fell and plant a new crop OWTTE	one mark for simple statement second for linked explanatory statement	1 1
c(i)	any two from (mainly) alien species planted therefore support less wildlife dark/no seasonal colour change/ regular outlines therefore do not blend with landscape coniferous trees intercept acid deposition and/or produce acidic litter and so contribute to acidification of soils/watercourses close planting (hence limited space) hence limited recreational value loss of habitat specified habitat example for second mark creates monoculture leading to spread of disease/pests forestry conflicts with other land uses eg agriculture/nature conservation	one mark for simple statement second for linked explanatory statement	1 1 1 1

continued

Question 4 (continued) 3441 H**Question 9 3441H**

	answers	extra information	mark
(ii)	any one from provides habitat for some species good for recreational use reduced reliance on imports create employment acts as a carbon sink reduce runoff/soil erosion/ sedimentation generates income higher yield reduces pressure on natural forests provides useful resource OWTTE		1
Total			13

Question 5 3441 H

Question 10 3441 F

	answers	extra information	mark
a(i)	inversely correlated/as one increases the other decreases		1
(ii)	thermal pollution		1
(iii)	respiration		1
(iv)	oxygen concentration fell (below 6ppm) therefore trout likely to have been killed/migrated		1 1
b(i)	permit /licence allowing specified discharges to water OWTTE		1
(ii)	Environment Agency		1
c	any two from samples taken from same depth samples taken at same places samples taken at same time of day replicates calibration of meter/use same meter/ equipment cleaning between samples		1 1
Total			9

Question 6 3441 H

	answers	extra information	mark
a(i)	£168		1
(ii)	House B	one mark for correct plan	1
	less heat loss through walls	one mark for simple statement	1
	because of terrace construction OWTTE	second mark for linked explanatory statement	1
b(i)	double glazing		1
(ii)	any one from		1
	cheap easy to install most cost effective method shortest payback time		
(iii)	cavity wall insulation	one mark for correct choice	1
	it is fitted to smallest number of homes to date	one mark for simple statement	1
	therefore greatest scope for increase	second for linked explanatory statement	1
	greatest % of heat is lost through walls therefore has potential to make greatest saving	if loft insulation or double glazing suggested allow 1 mark for measure is already fitted in most houses so will make future contribution to energy efficiency OWTTE	1
c	any two from		
	low energy lightbulbs or other specified domestic non-heating economy	one mark for simple statement	1
	use less electricity	second for linked explanatory	1
	use of public transport/walking/ cycling	allow up to two different domestic economy measures but must have different explanations for second marks	
	reduces use of fuel		1
	recycling manufacture from recycled materials uses less energy than from virgin materials		1
	re-use saves energy cost of new manufacture		
Total			15

Question 7 3441 H

	answers	extra information	mark
a(i)	Area A = Y Area B = X Area C = Z	1 correct = 1 mark 3 correct = 2 marks	2
(ii)	forest has least runoff because of increased interception/ evapotranspiration/infiltration forest has least soil erosion because of reduced runoff/because vegetation binds soil together	one mark for simple statement second for linked explanatory statement if area A is identified as Z (cereal crop) in (a)(i) no marks are possible in (a)(ii) if area A is identified as X (grassland) award maximum of 2 marks for appropriate explanation in (a)(ii)	1 1 1 1
b(i)	A = terracing B = contour ploughing/farming	(accept strip cropping)	2
(ii)	Photo A (terracing) hillside cut into steps so that flat surfaces encourage infiltration rather than runoff Photo B (contour ploughing/strip cropping) ploughing parallel with contours/ around slopes means ridges and furrows are perpendicular to slope therefore reducing runoff and increasing infiltration	(also accept walls retain soil/prevent downslope movement OWTTE) also accept mention of alternate cropped and bare strips which reduce runoff and retain soil	1 1
c	any one from windbreaks/shelterbelts/strip cropping/hedgerows which reduce windspeed and so reduce erosion zero cultivation so that soil surface is not loosened and exposed to wind leaving crop residues on soil surface protects from wind/reduces windspeed at soil surface	one mark for simple statement second for linked additional detail	1 1
Total			12

Question 8 3441 H

	answers	extra information	mark
a(i)	lightning	accept nitrogen fixation/nitrogen fixing bacteria	1
(ii)	nitrogen-fixing bacteria		1
	leguminous plants		1
(iii)	denitrifying bacteria		1
(iv)	waste gases contain oxides of nitrogen/add to soil nitrates		1
	nitrates increase yield of crops		1
	therefore less need to buy/use chemical fertilisers		1
b(i)	nitrifying bacteria		1
(ii)	plants		1
(iii)	ammonia builds up (because of presence of fish/excretion and decomposition of waste)	one mark for simple statement	1
	but there are no (nitrifying) bacteria in a clean tank to remove it	second for linked explanatory statement	1
Total			11

Question 9 3441 H

	answers	extra information	mark
a(i)	Common Agricultural Policy	accept Agriculture	1
(ii)	farmers received production subsidies which encouraged overproduction because they could sell any amount of product/regardless of market demand	one mark for simple statement second for linked explanatory statement	1 1
(iii)	Government Organisation Natural England Countryside Council for Wales Environment and Heritage Service Scottish Natural Heritage Voluntary Organisation RSPB named county Wildlife Trust Wildlife and Wetlands Trust or other appropriate organisation	accept English Nature accept Cyngor Cefn Gwlad Cymru do not accept Greenpeace or FoE	1 1
b(i)	any three from looked at 80 pairs of farms large sample size making results more likely to be representative OWTTE paired organic and ordinary farms ordinary farms acted as control all farms in lowland England therefore effects of climatic variation reduced all were cereal farms therefore influence of farming type reduced	one mark for simple statement second for linked explanatory statement	1 1 1 1 1 1
(ii)	organic farms had more hedgerows therefore more habitats/wildlife corridors	one mark for simple statement second for linked explanatory statement	1 1

continued

Question 9 (continued) 3441 H

	answers	extra information	mark
(iii)	any one from less/no use of chemical pesticides therefore organisms not killed less use of chemical fertilisers therefore less damage to aquatic life (by eutrophication)less displacement of plant species by fast-growing species OWTTE	one mark for simple statement second for linked explanatory statement	1 1
Total			15

Question 10 3441 H

	answers	extra information	mark
a	A cooling towers		1
	B chimney		1
(i)	warm water holds less oxygen in solution so water has to be cooled to avoid harm to aquatic life	accept power stations use water for cooling for 1 mark	1 1 1 1
b	Quality of Written Communication correct linking of ideas as specified by one of the following paired statements sulphur dioxide contributes to acid deposition causing damage to any one of trees, lichens, aquatic life, buildings credit description of additional effects may be reduced by Flue Gas Desulphurisation which removes sulphur dioxide from the stream of waste gas before it is discharged or by switching to low sulphur coal which reduces production of the gas	1 mark for simple statement and 1 mark for additional detail maximum of 5 marks (4 + 1) for answer dealing only with effects or only with mitigation measures accept valid explanation of FGD process eg limestone – gypsum do not accept substitution of nuclear, gas or renewables for coal	1 1 1 1 1 1 1
Total			13