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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Environmental Science 3441

3441/H

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.

Higher Tier - 3441H

Question 1 3441H Question 6 3441F

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

Question 2 3441H Question 7 3441F

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

Question 3 3441H Question 8 3441F

	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	one mark for simple statement second for linked explanatory statement	1 1
	therefore do not poison otters		

continued

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

	answers	extra information	mark
c(i)	risks to human health / contamination of food / water		1
(ii)	organic farming		1
(iii)	any **one** from biological control which uses predators to control prey species 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	one mark for simple statement second for linked additional detail	1 1
Total			**11**

Question 4 3441H Question 9 3441F

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

	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 second for linked explanatory statement	1 1 1 1
Total			**12**

Question 5 3441H Question 10 3441F

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

	answers	extra information	mark
b(i)	any **one** from burning of oil floating on surface skimmers / OWTTE pick up oil from surface of the sea dispersants break up slick so oil sinks rather than floating on to shorelines bioremediation bacteria are encouraged to 'feed on' oil	one mark for simple statement second for linked additional detail credit mention of separation of oil from sea water accept absorption of floating oil by straw etc	1 1
(ii)	any **one** from double-hulled tankers making them less likely to be breached in groundings / collisions 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	one mark for simple statement second for linked additional detail	1 1
Total			**10**

Question 6 3441H

	answers	extra information	mark
a(i)	phosphorus potassium	accept in either order accept potash and phosphate	1 1
(ii)	108 kg		1
b(i)	points plotted correctly joined by smooth line through points		1 1
(ii)	graph initially rises (steeply) because nitrogen is limiting factor OWTTE graph then levels off because some other factor becomes limiting OWTTE	one mark for simple statement second for linked explanatory statement	1 1 1 1
(iii)	rate – accept any value between 150 and 250 graph levels off so further applications do not increase yield therefore cost incurred with no benefit / further applications are wasted excess fertiliser likely to be leached (OWTTE) leading to eutrophication / contamination of water	one mark for simple statement second for linked explanatory statement	1 1 1
Total			**12**

Question 7 3441H

	answers	extra information	mark
a(i)	0.75 million tonnes	accept 0.6 – 0.8	1
(ii)	2.75 million tonnes	accept 2.6 – 2.8	1
(iii)	any **one** from both peak in 1990 both decline steadily after 1990		1
(iv)	NO_x from transport increases steadily till 1990 but total NO_x fluctuates slightly / does not rise as steeply		1 1
(v)	catalytic converter		1

continued

Question 7 (continued) 3441H

	answers	extra information	mark
b(i)	any **one** from	one mark for simple statement	1
	contributes to acid deposition which can damage lichens which are sensitive to pollution	second for linked additional detail	1
	acid deposition can contribute to 'forest death'		
	acidification of watercourses can damage fish / aquatic life.		
	can add nitrogen as a nutrient to naturally nitrogen poor ecosystems leading to loss of biodiversity / eutrophication		
	contributes to photochemical smog harming plants / animals		
	NO_x = greenhouse gas (strictly N_2O) therefore adds to global warming		
	NO_x causes ozone depletion leading to health problems / damage plant life		
(ii)	pollution produced in one country affects other countries to which they are carried by wind	accept specific example	1 1
c	Taj Mahal is largely made of limestone		1
	which is susceptible to corrosion by acid deposition		1
	TMCTIP will reduce number of vehicles in local area		1
	and will therefore reduce acidic emissions		1
Total			**14**

Question 8 3441H

	answers	extra information	mark
a(i)	limit on amount of fish which can be caught		1
(ii)	fishing faster than fish can breed / replace themselves		1
b(i)	farming cod will mean less need to catch wild fish giving chance for stocks to recover		1 1
(ii)	any **one** from employment income reduced need for imports	accept 'increased food production'	1

continued

Question 8 (continued) 3441H

	answers	extra information	mark
c(i)	nutrients can cause <u>eutrophication</u> leading to damage to aquatic life	one mark for simple statement (must use <u>eutrophication</u>) second for linked explanatory statement	1 1
(ii)	any **two** from visual impact genetic contamination of wild stocks spread of disease / parasites to wild fish / among farmed fish need to catch wild fish to feed to farmed ones animal rights abuse medication contaminates water pressure to cull predators toxicity of anti-fouling paints harm to human health caused by aquatic pollutants		 1 1
Total			**9**

Question 9 3441H

	answers	extra information	mark
a	glucose water carbon dioxide	accept sugar carbohydrate	3
b(i)	as temperature increases so does respiration rate		1
(ii)	cherries stored at higher temperatures respire faster therefore using up sugar / glucose / carbohydrate and so losing bulk	accept converse statements	1 1
c(i)	arrow points to left		1
(ii)	if respiration occurs oxygen will be used therefore volume of gas in tube will decrease		1 1

continued

Question 9 (continued) 3441H

	answers	extra information	mark
(iii)	any **two** from need for tube with dead cherries or inert material as a control need for thermometer to measure temperature need for replicates to calculate averages / to rule out anomalies same number / mass of cherries in all tubes to enable fair comparison same mass of soda lime to allow fair comparison same sized tube to allow fair comparison same variety of cherries to allow fair comparison	one mark for simple statement second for linked explanatory statement allow same reason only once	1 1 1 1
Total			**13**

Question 10 3441H

	answers	extra information	mark
a	A = fission B = fusion		1 1
b(i)	A		1
(ii)	**Quality of written communication** Correct use of scientific terms (control rods; neutrons; fission; reactor core) control rods fully out of reactor core so neutrons can pass freely therefore fission proceed at max rate	award mark for appropriate use of any two of these words	1 1 1
c(i)	22%		1
(ii)	340 terawatt hours		1
(iii)	need water supply for cooling		1 1

continued

Question 10 (continued) 3441H

	answers	extra information	mark
d	**in favour** uses less fuel therefore reduced mining / transport impacts no carbon dioxide emissions therefore does not contribute to greenhouse effect no sulphur dioxide or NO_x therefore does not contribute to acid deposition **against** nuclear power linked with nuclear weapons therefore some have ethical objections / security fears risk of accidents eg Chernobyl, Windscale, 3 Mile Island risk of exposure to radiation which is mutagenic produces dangerous waste posing disposal issues long lead – in time because of health and safety / planning reactors radioactive causes decommissioning problems opposition increases planning time / costs	one mark for simple statement second for linked explanatory statement maximum 4 marks for answer covering only one side of argument maximum 6 marks for single statements only	8
Total			**18**