



## General Certificate of Secondary Education

# Environmental Science 3441

*3441/H*

## Mark Scheme

*2005 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.

## Question 1 3441/H

## Question 6 3441/F

	<b>answers</b>	<b>extra information</b>	<b>mark</b>
a(i)	any <b>three</b> from forced movement of people harm to dolphins historic sites submerged build up of sewage and industrial waste OWTTE	accept dam burst	3
(ii)	any <b>two</b> from irrigation water recreation transport artery tourist attraction fish farming water supply reservoir nature conservation	can accept 2 distinct forms of recreation for 2 marks	2
b(i)	development which helps meet present needs without damaging or unnecessarily depleting resources for the future OWTTE	accept Brundtland definition	1 1

continued

## Question 1 (continued) 3441/H

## Question 6 3441/F

	answers	extra information	mark
(ii)	any <b>one</b> from	one mark for simple statement	1
	reduction of emissions of carbon dioxide hence reduced addition to greenhouse effect	second for elaboration	1
	reduction of emissions of sulphur dioxide and oxides of nitrogen hence reduced acid deposition		
	reduced fossil fuel use therefore reduced air pollution		
	reduced need to extract fossil fuels hence reduced impact(s) of extraction		
	reduced need to use nuclear power hence reduced associated risk (risk must be specified)		
	provides renewable energy source therefore reduced fossil fuel/nuclear use		
(iii)	any <b>one</b> from	one mark for simple statement	1
	increased emissions of methane hence addition to greenhouse effect	second for elaboration	1
	flooded areas		
	causes displacement of population		
	loss of archaeological/historical sites represents lost heritage for future generations		
	danger to Yangtze River Dolphin threatens extinction		
	accumulation of pollutants behind dam damages environment for present (and/or future generations)		
<b>Total</b>			<b>11</b>

## Question 2 3441/H

## Question 7 3441/F

	<b>answers</b>	<b>extra information</b>	<b>mark</b>
a(i)	points correctly plotted  dashed line complete		1  1
(ii)	1999	accept 1998-2000	1
b(i)	any <b>two</b> of  increase in total population  (rapid) growth rate in population of less developed regions  near stable population in more developed regions		2
(ii)	any <b>two</b> from  lack of horizontal grid lines  imprecise vertical scale  lack of precise definition of more and less developed  3D effect ambiguous – should value be read from ‘top/back’ or ‘bottom/front’ of bar?  data only at 5 year intervals		2
c(i)	fuelwood gathering leads to soil erosion  leading to loss of cultivable land for food production  reduced soil fertility because of reduced organic matter input  reduced shade/shelter leads to damage by sun/wind/rain impact	one mark for simple statement of problem, second for linked explanatory statement  accept less food from trees for 2 marks	1  1
(ii)	if manure is burnt nutrients not returned to soil  hence reduced crop yields	one mark for simple statement of problems, second for linked explanatory statement	1  1
<b>Total</b>			<b>11</b>

## Question 3 3441/H

## Question 8 3441/F

	answers	extra information	mark
a(i)	A = photosynthesis		1
	B = respiration		1
	C = combustion/burning		1
(ii)	limestone/chalk		1
b(i)	photosynthesis and respiration/combustion	both parts must be correct for one mark	1
(ii)	<b>either</b> photosynthesis and fossil fuel formation  <b>or</b> solution in water and limestone formation	both parts must be correct for mark	1
(iii)	carbon dioxide used by plants in photosynthesis	accept/through food (chain) for 1 mark	1
	plants used as food by animals		1
<b>Total</b>			<b>8</b>

## Question 4 3441/H

## Question 9 3441/F

	<b>answers</b>	<b>extra information</b>	<b>mark</b>
a(i)	A because of larger particle/pore size		1
(ii)	clay soils usually contain more nutrients than sandy soils		1
(iii)	any <b>one</b> of  large pore spaces/lack of cohesion OWTTE allows easier penetration by spade/plough  less water held in sandy soil so soil is lighter	one mark for simple statement, second for linked explanatory statement	1 1
b(i)	any <b>one</b> of  - depth of sample  because nutrient content could vary with depth  - method of choosing location of sample (e.g. random location)  because location could be biased/could affect outcome  need details of equipment used because consistent/repeatable method required	one mark for valid extra detail, second for statement and reason  accept need for details of time of sampling to make samples consistent	1 1
(ii)	- one sample from garden and the other from field  therefore uncontrolled variables/likely that fertilizer use or other management will affect outcome  one sample from each area not enough  impossible to be sure that samples are representative OWTTE		1  1  1  1
<b>Total</b>			<b>10</b>

## Question 5 3441/H

## Question 10 3441/F

	answers	extra information	mark
a(i)	screening		1
(ii)	heavier particles	do not accept 'larger'	1
	sink to bottom of tank		1
	and so are separated from liquid OWTTE		1
(iii)	organic matter (in sewage)		1
	is broken down (decomposed)		1
	by micro-organisms/bacteria/fungi		1
(iv)	aerobic = with oxygen anaerobic = without	accept air	1
(v)	methane		1
(b)	<b>Quality of written communication</b> correct use of scientific terms (organic matter; decompose(d); micro- organisms; bacteria; fungi; eutrophication; oxygen; algae; nutrients;)	correct use of 2 scientific terms	1
	organic matter in sewage	accept nutrients/named nutrient cause algal bloom	1
	is decomposed/broken down	algae decomposed oxygen removed	1
	by micro-organisms/bacteria/fungi in water	accept eutrophication for 1 mark	1
	which removes essential oxygen from water		1
<b>Total</b>			<b>14</b>

**Question 6 3441/H**

	<b>answers</b>	<b>extra information</b>	<b>mark</b>
a(i)	chemical substances/compounds		1
	used to kill harmful organisms	do not accept 'to kill pests' if unexplained	1
(ii)	crop variety created by transfer of genes		1
	from a different species		1
(iii)	farmers who do not use any <b>two</b> of the following chemical fertilizers chemical pesticides very intensive livestock management methods GMOs	accept not using any one of these with specified organic alternative	2
b(i)	-higher yields because of pest resistance  -reduced damage to wildlife/reduced costs/less risk of pesticide residue in food  because of reduced need for pesticide use	one mark for simple statement of advantage; second for explanation	4
(ii)	any <b>two</b> from  - belief that GM is simply 'wrong' because it is unnatural/may offend religious sensitivities  -risk to human health  because of unaccustomed gene combinations in food/risk of transfer of allergens to unexpected food items	one mark for simple statement of objection; second for explanation	4

continued



**Question 6 (continued) 3441/H**

	<b>answers</b>	<b>extra information</b>	<b>mark</b>
	<ul style="list-style-type: none"><li>- possible emergence of invasive ‘super weeds’</li><li>because of pollen transfer from crops to wild plants</li><li>- possible increase in herbicide use</li><li>because of crop resistance</li><li>- opposition to (multinational) companies which produce GM crops</li><li>because farmers become “tied in” to use of crop and associated agrochemicals</li></ul>		
<b>Total</b>			<b>14</b>

**Question 7 3441/H**

	<b>answers</b>	<b>extra information</b>	<b>mark</b>
a(i)	£192		1
(ii)	- reduced need to extract new materials  hence reduced impacts of extraction/resources last longer  - reduced need to dispose of demolition waste  hence reduced land take/visual impact of landfill sites	1 mark for simple statement of benefit; second for explanation	4
b(i)	any <b>two</b> from  nature conservation/educational use  specified recreational use	accept landfill	2
(ii)	any <b>three</b> from  - car parking  to avoid dangerous/unsightly roadside parking  - toilets  for comfort/convenience of visitors  - observation hides  to allow people to watch wildlife without causing disturbance  - paths/nature trails  to allow safe access to potentially hazardous site/to channel visitors so some areas remain undisturbed  - information/interpretation facilities  to allow visitors to learn from visit	1 mark for simple statement of measure; second for explanation	6

continued

**Question 7 (continued) 3441/H**

	<b>answers</b>	<b>extra information</b>	<b>mark</b>
	<ul style="list-style-type: none"> <li>- fencing</li> <li>to prevent unauthorised access to site</li> <li>tree planting – as habitat or visual scenery</li> <li>credit mention of up to two specified facilities connected with particular recreational use e.g. slipways to launch boats, clubhouse for post-activity relaxation, stocking with fish to maintain stocks for anglers, etc.</li> <li>appropriate planning</li> <li>permission/licence to comply with legal requirements</li> <li>demolition/removal of quarry plant to improve safety/aesthetics of site</li> <li>- regrading/profiling of site OWTTE</li> <li>to allow access/promote safety</li> <li>- reintroduction of species – to replace organisms lost during extraction</li> <li>- employment of wardens/interpretation staff</li> <li>- bins – to avoid littering</li> <li>landfill requires impermeable lining (or use for inert waste only) to avoid pollution</li> </ul>		
<b>Total</b>			<b>13</b>

**Question 8 3441/H**

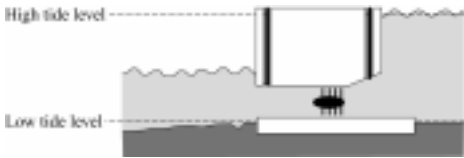
	<b>answers</b>	<b>extra information</b>	<b>mark</b>
a	90.67%	accept 90.7%	1
b(i)	growing population requires more food; hence forest clearance		1
	which leads to habitat loss/increased conflict between people and elephants		1
(ii)	fences will prevent/ reduce elephant damage to crops/homes		1
	making villagers less likely to wish to kill elephants		1
c(i)	Convention on International Trade in Endangered Species	accept CITES	1
(ii)	<b>In favour</b> <b>either of</b>  - Ivory sales will raise money  which can be used to fund conservation projects  - Unchecked the elephant population may continue to rise  leading to increased conflict between villagers and elephants  control of elephant population may be necessary to prevent starvation etc. of elephants/ damage to trees etc.		2
	<b>Against</b> <b>either of</b>  - some people believe that elephants simply should not be killed  because they have rights  - ‘legitimate’ trade in ivory will increase poaching  by acting as a cover for illegal ivory sales		2

continued

**Question 8 (continued) 3441/H**

	<b>answers</b>	<b>extra information</b>	<b>mark</b>
(iii)	<b>either of</b>  - captive breeding  and re-introduction  - captive animals may raise awareness  leading to fund-raising or political pressure on behalf of wild elephant conservation		2
<b>Total</b>			<b>12</b>

**Question 9 3441/H**

	<b>answers</b>	<b>extra information</b>	<b>mark</b>
a	gravity		1
b	<p>raised sluice gates</p> <p>water held at high tide level on estuary side</p> <p>water lower (not necessarily low tide) on sea-ward side of barrage</p>		<p>1</p> <p>1</p> <p>1</p>
c	difference between level of high and low tides		1
d(i)	Tidal power    Yes    Yes	both must be correct	1
(ii)	Tidal power is variable because height/time of tides changes from day to day		1
	its is reliable because changes can be predicted		1
(e)	<p>any <b>two</b> from</p> <ul style="list-style-type: none"> <li>- tidal current turbines do not block estuaries</li> <li>therefore do not impede shipping/fish</li> <li>- reduced visual impact</li> <li>because located further offshore</li> <li>- smaller structures</li> <li>therefore reduced need to extract construction materials</li> <li>do not impede water flow</li> <li>therefore do not risk damage to feeding areas for (intertidal) organisms</li> </ul>	2 × 2	4
<b>Total</b>			<b>12</b>

**Question 10 3441/H**

	<b>answers</b>	<b>extra information</b>	<b>mark</b>
a(i)	1 = short wavelength radiation		1
	2 = absorption by Earth's surface	accept heating of Earth's surface	1
	3 = re-radiation	accept radiation emitted	1
	4 = long wavelength radiation	accept infra-red	1
(ii)	because it is difficult to be sure whether any changes which are observed are part of climate change		1
	or simply short term fluctuations in weather		1
(b)	<p><b>Quality of written communication</b>            Correct linking of ideas as specified by the following paired statements</p> <p>any <b>four</b> from</p> <ul style="list-style-type: none"> <li>- international agreements by governments (e.g. Kyoto)</li> </ul> <p>which will commit countries to reducing levels</p> <ul style="list-style-type: none"> <li>- increased use of public transport /rail freight/cycling/walking</li> </ul> <p>which will reduce fuel use in transport and therefore reduce carbon dioxide emissions</p> <ul style="list-style-type: none"> <li>- reduction of domestic demand for energy</li> </ul> <p>e.g. shower not bath, low energy light bulbs or other specified measure</p> <ul style="list-style-type: none"> <li>- replacement of fossil fuel power stations by renewables/nuclear</li> </ul> <p>since neither of these involve large scale greenhouse gas emissions</p> <ul style="list-style-type: none"> <li>- reduction of livestock numbers</li> </ul> <p>since many livestock produce methane which is a greenhouse gas</p>		

continued

**Question 10 (continued) 3441/H**

	<b>answers</b>	<b>extra information</b>	<b>mark</b>
	increased recycling reduces energy consumption during manufacture  reduced use of CFCs by international agreement		9
<b>Total</b>			<b>15</b>