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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Environmental Science 3441

3441/F

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

<table>
<tr><th></th><th>answers</th><th>extra information</th><th>mark</th></tr>
<tr><td>a</td><td>Coal, oil and natural gas are all fossil fuels. They were formed millions of years ago when dead plants and animals were buried under layers of sediment. They were formed deep underground where there was no oxygen and they were affected by heat and pressure.</td><td></td><td>5</td></tr>
<tr><td>b(i)</td><td>A = deep/underground (mining) shaft
B = opencast (mining)/strip mining</td><td></td><td>2</td></tr>
<tr><td>(ii)</td><td>Subsidence

= lowering/collapse of ground surface</td><td></td><td>1

1</td></tr>
<tr><td>c(i)</td><td>F Coal
↓
D Burnt to heat a boiler
↓
B Produces high pressure steam which turns a turbine
↓ → Hot water is passed through a cooling tower E
↓
A Which drives a generator

<table><tr><th colspan="2">Key</th></tr><tr><td>A</td><td>Electrical energy</td></tr><tr><td>B</td><td>Kinetic energy</td></tr><tr><td>C</td><td>Gravitational potential energy</td></tr><tr><td>D</td><td>Heat energy being used</td></tr><tr><td>E</td><td>Heat energy being wasted</td></tr><tr><td>F</td><td>Store of chemical potential energy</td></tr></table></td><td></td><td>4</td></tr>
</table>

continued

Question 1 (continued) 3441/F

	answers	extra information	mark
(ii)	any **two** from CO_2 (which adds to) greenhouse effect/global warming CO toxicity/harm to human health SO_2/NO_x (which add(s)) to acid deposition/rain	1 mark for pollutant 1 mark for appropriate effect 2 × 2 ignore just 'pollution'	4
Total			**17**

Question 2 3441/F

	answers	extra information	mark
a(i)	any **two** from education centre wildlife observation hides car park Whisby Natural World water ski lake		2
(ii)	any **three** from play area toilets shop trails/paths seats information/sign boards café/other food provision picnic area litter bins disabled access railway crossing security fencing life saving equipment first aid		3
(iii)	nature lovers (OWTTE) in conflict with water skiers/school groups because of noise/disturbance **OR** fishing/angling vs watersports therefore disturbance	1 mark for each appropriate party and one for reason for conflict	3

continued

Question 2 (continued) 3441/F

	answers	extra information	mark
b(i)	any **two** from mortar concrete bulk fill specified amenity use road use improved drainage	'building material' alone is insufficient	2
(ii)	any **three** from dust which affects appearance of surroundings/households/health air pollution caused by machinery visual impact/damage to scenery caused by sand quarries/associated plant noise causes disturbance to neighbours/wildlife lorries cause traffic hazard/air pollution/dust/ congestion creation of lakes provides aquatic habitats habitat loss by creation of quarry	1 mark for stated impact second for linked description/ elaboration 2×3 vague reference to pollution insufficient	6
Total			**16**

Question 3 3441/F

	answers	extra information	mark
a(i)	England		1
(ii)	Scotland		1
(iii)	Wales		1
b(i)	47.7 / 47.68 / 47.679…		1
(ii)	any **one** from recycling re-use making paper from alternative raw materials reduction of specified use		1
c(i)	any **three** from edges straighter in A A reaches closer to summits straight rides in A – curved in B A all coniferous – B includes broadleaves/ trees more mixed in B A mainly alien species OWTTE B mainly native more open space left in B (– less in A)/ fewer trees in B		3
(ii)	B mixture of tree species/more niches (OWTTE)/native species harbour native wildlife/greater biodiversity A Conifer monoculture favours Red Squirrel	no mark for choice of plan	1

continued

Question 3 (continued) 3441/F

	answers	extra information	mark
(iii)	B outlines of plantation look more natural/broadleaves give seasonal colour change/more wildlife/greater variety of trees	no mark for choice of plan	1
Total			**10**

Question 4 3441/F

	answers	extra information	mark
a(i)	ozone is a form of the element oxygen		1
(ii)	scientists have found that **CFC compounds** damage the Earth's ozone layer. The ozone layer is found in the **upper** parts of the Earth's atmosphere. It provides important protection against **ultraviolet** radiation which can cause harm to people and other forms of life.		3
b(i)	any **two** from (skin) cancer sun burn cataracts/damaged eyesight		2
(ii)	may damage food plants	accept damage to phytoplankton affects fisheries	1
(iii)	Montreal Protocol		1
Total			**8**

Question 5 3441/F

	answers	extra information	mark
a(i)	water		1
(ii)	carbon dioxide		1
(iii)	light		1
(iv)	chlorophyll		1
(v)	oxygen		1
b(i)	any **three** from replicates measure volume of oxygen (rather than counting bubbles) specified concentration of sodium hydrogen carbonate standardise size/species of pondweed refining methods of counting e.g. when bubbles hit surface/pass a mark expose to standardised light intensity wait till bubbles released at steady rate before counting		3
b(ii)	1. 37 °C 2. rate of photosynthesis increases with temperature then decreases more rapidly/appropriate reference to figures	allow 35-39 appreciation of faster decrease shown either by statement to that effect or reference to figures essential for second mark	1 1 1

continued

Question 5 (continued) 3441/F

	answers	extra information	mark
c	**Quality of written communication** correct linking of ideas		1
	opening/closing of vents prevents temperature rising too high/falling too low		1
	which will allow maximum rate of photosynthesis		1
	and therefore maximum crop yield		1
Total			**15**

Question 6 3441/F Question 1 3441/H

	answers	extra information	mark
a(i)	any **three** 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 **two** 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

continued

Question 6 (continued) 3441/F

	answers	extra information	mark
b(i)	development which helps meet present needs without damaging or unnecessarily depleting resources for the future OWTTE	accept Brundtland definition	1 1
(ii)	any **one** from reduction of emissions of carbon dioxide hence reduced addition to greenhouse effect 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	one mark for simple statement second for elaboration	1 1
(iii)	any **one** from increased emissions of methane hence addition to greenhouse effect 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)	one mark for simple statement second for elaboration	1 1
Total			**11**

Question 7 3441/F Question 2 3441/H

	answers	extra information	mark
a(i)	points correctly plotted dashed line complete		1 1
(ii)	1999	accept 1998-2000	1
b(i)	any **two** from increase in total population (rapid) growth rate in population of less developed regions near stable population in more developed regions		2
(ii)	any **two** 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
Total			**11**

Question 8 3441/F Question 3 3441/H

	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)	**either** photosynthesis and fossil fuel formation **or** 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
Total			**8**

Question 9 3441/F Question 4 3441/H

	answers	extra information	mark
a(i)	**A** because of larger particle/pore size		1
(ii)	clay soils usually contain more nutrients than sandy soils		1
(iii)	any **one** from 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 **one** from - 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
Total			**10**

Question 10 3441/F Question 5 3441/H

	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)	**Quality of written communication** 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
Total			**14**