A-LEVEL
ENVIRONMENTAL STUDIES

ENVS2: The Physical Environment
Mark scheme

2440
June 2014

Version: 1.0 Final

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' 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.

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Environmental Studies

June 2014 **ENVS2**

Instructions: ; = 1 mark / = alternative response A = accept R = reject

AO = Assessment Objective

Question	Answers	Mark	AO / Spec. Ref.
1	(in range) 0.035–0.040**;** combustion of fossil fuels/wood/named carbon based fuel**;** [**A** forest fires] (bacterial) denitrification**;** photosynthesis**;** livestock farming/rice farming/padi farming/landfill/extraction of fossil fuels/reservoirs (DOM anaerobic decomposition)**;** [**A** permafrost melting if linked to global warming/named human activity]	5	AO1 3.2.1
Total		**5**	

Question	Answers	Mark	AO / Spec. Ref.
2(a)	process in reservoir/treatment process not needed**;;** one linked explanation**;;** eg sedimentation/settling static water/turbidity/particles/suspended solids [**A** filtration not required] sterilisation/UV light/ozone treatment/chlorination pathogens killed/removed aeration reduction of odours/dissolved metals activated carbon filters degradation/adsorption of organic substances/pesticides [**R** screening/litter removal/reverse osmosis not needed]	4	AO2 3.2.2
2(b)(i)	reduced (extremes)/more constant temperature**;** high heat capacity/thermal mass**;** heat storage/heat absorbed and released later/slow temperature change**;** role of wind in heat transfer**;** **or** reduced (extremes)/more constant temperature**;** increased evaporation/cloud cover**;** increased albedo/reduced IR transmission**;**	Max 2	AO1+2 3.2.2
2(b)(ii)	increased cloud albedo**;** reduced sunlight**;** low friction**;** increased wind speed**;** increased evaporation**;** increased humidity/increased precipitation/named form of precipitation**;**	Max 4	AO1 3.2.2
Total		**10**	

Question	Answers	Mark	AO / Spec. Ref.
3(a)	more ore/rock needs to be extracted/processed/waste removed/named processing activity**;** (chemically) difficult to extract very low concentrations/separate metals from ore/extra processes needed/more refining**;**	Max 1	AO3 3.2.3
3(b)	50 [**A** 43–50] and 150 [**A** 150–160]**;** [**A** figure based on subtraction of chosen values within range (100–117)] 200 (% change) or correct calculation from selected values (ecf)**;** award both marks for correct final answer	2	AO2 3.2.3
3(c)	one suitable method**;** detail of how it works**;** eg leachate collection/recycling/evaporation electrolysis *Thiobacillus*/*Acidithiobacillus*//bacteria oxidise sulfur/produce acid/acidic solution dissolves metal/copper phytoremediation/hyperaccumulators/brassicas absorption of metal ion exchange/polymer surface adsorption of metal/ions addition of more reactive metal precipitation gold dissolves in mercury/(sodium) cyanide	2	AO1 3.2.3

Question	Answers	Mark	AO / Spec. Ref.
3(d)	named exploratory method**;** detail of how method works**;** eg gravimetry detection of changes in rock density magnetometry detection of changes in rock magnetism geobotany plants as indicators of rock type seismic surveys/echoes/vibrations/sonar/radar/ultrasound indicate depth/shape/hardness/density of rock satellite/aerial imagery named geological structures/topography/reflectance signatures resistivity measurements relative resistances indicate rock type radioactivity measurement indicates specific rocks/named example UV detection fluorescence of particular minerals [**R** core drilling, unqualified remote sensing]	2	AO1 3.2.3
3(e)	more money available for extraction/investment/expensive techniques**;** lower grade ores can be exploited**;** COOG goes down**;**	3	AO2 3.2.3
Total		**10**	

Question	Answers	Mark	AO / Spec. Ref.
4(a)	190 (years)**;**	1	AO3 3.2.3
4(b)(i)	named human activity**;** change in linked process**;** eg ploughing/drainage more (aerobic) decomposition/respiration named human activity causing climate warming more rapid decomposition/methane release from soil (permafrost melting) reduced vegetation/deforestation/crop harvesting less released from DOM decay padi fields less carbon released than aerobic conditions [**R** change in form of carbon release without amount]	2	AO2 3.2.3
4(b)(ii)	named human activity**;** change in linked process**;** eg deforestation/vegetation loss/harvesting less photosynthesis/carbon capture/sequestration afforestation/planting more photosynthesis/carbon capture/sequestration combustion of carbon-based fuels releasing CO_2 more photosynthesis/carbon capture/sequestration named human activity causing climate warming more photosynthesis/carbon capture/sequestration	2	AO2 3.2.3

Question	Answers	Mark	AO / Spec. Ref.
4(c)	reduction of overall change**;** restoration of balance/equilibrium**;** named process affected by **increase;;** effect of changed process**;** eg faster photosynthesis due to raised carbon dioxide faster photosynthesis due to raised temperature caused by raised carbon dioxide more carbon dioxide removed/less in the atmosphere named process affected by **decrease;;** effect of changed process**;** eg slower photosynthesis due to decreased carbon dioxide slower photosynthesis due to decreased temperature caused by lowered carbon dioxide less carbon dioxide removed/more in the atmosphere	Max 5	AO1 3.2.3
Total		**10**	

Question	Answers	Mark	AO / Spec. Ref.
5(a)	aeration**;** decomposers/detritivores**;** decomposition/breakdown of DOM**;** indigestible/residual organic matter**;** deeper inaccessible OM**;** dynamic equilibrium**;** OM removed/not returned on harvesting**;** reference to data/change in amount**;**	Max 3	AO3 3.2.3
5(b)	weigh wet sample**;** heat wet sample at about 100 ^{o}C**;** [**A** 80 ^{o}C –150 ^{o}C] reweigh to constant mass**;** calculate mass change/percentage composition/proportional composition**;**	Max 3	AO3 3.2.4
5(c)	frequency of sampling to allow for changes/fluctuations**;** named timescales (over which conditions may change)**;** named factors that may cause change**;;;** eg temperature evaporation precipitation transpiration harvest soil compaction [**R** unqualified weather]	Max 4	AO3 3.2.4
Total		**10**	

Question	Answers	Mark	AO / Spec. Ref.
6(a)(i)	annual rise and fall**;** long term/overall decline**;** faster decline until 1993**;** slower decline since 1993**;** smaller annual fluctuations 1998–2007**;**	Max 2	AO3 3.2.2
6(a)(ii)	reasons must be linked to trends identified in **(a)(i)** seasonal rainfall/demand changes**;** increased abstraction/abstraction greater than recharge/increased population demand/decreased precipitation/increase evaporation/increased runoff**;** increased abstraction/abstraction greater than recharge/increased population demand/decreased precipitation/increase evaporation/increased runoff**;** reduced abstraction/increased precipitation**;** smaller difference between abstraction, eg less industrial use, more conservation, **and** recharge/even rainfall distribution/abstraction related to supply**;**	Max 2	AO2 3.2.2
6(b)	salt/salinisation/salt water incursion**;** toxic/osmosis/dehydration**;**	2	AO1 3.2.2

Question	Answers	Mark	AO / Spec. Ref.
6(c)	increased personal hygiene/fewer water-borne diseases/pathogens**;** named water-borne disease/pathogen**;** eg typhoid/cholera/polio/dysentery/diarrhoea/*Bilharzia*/*E. coli* less time spent fetching water**;** lower mortality/less debilitating disease**;** can do more work/attend school**;** can do more work so increased income**;** less money spent on treating preventable health problems**;** reduced conflicts over water supply**;**	Max 4	AO2 3.2.2
Total		**10**	

Question	Answers	Mark	AO / Spec. Ref.
7(a)	ozone depletion/increased UV**;** [**A** chemical equation causing depletion] skin cancer/melanoma/retina damage/cataracts/mutation/ DNA damage**;**	2	AO2 3.2.1
7(b)	CFCs**;** named use of CFCs**;** eg aerosol (propellants)/solvents/blowing agents/refrigeration CFCs release chlorine**;** [**A** chemical equation]	Max 2	AO2 3.2.1
7(c)	Montreal Protocol**;** ban manufacture/use (of CFCs)**;** named alternative material**;;** eg HCFCs, HFCs, hydrocarbons, propane, butane, alcohols, nitrogen, ammonia reason why alternative material does not cause ozone depletion**;** eg less chemically stable, do not contain chlorine named alternative process**;;** eg pump action sprays, stick deodorants safer disposal of waste CFCs**;** named disposal technique**;** eg incineration	Max 6	AO1 3.2.1
Total		**10**	

Question	Answers	Mark	AO / Spec. Ref.
8(a)(i)	time/static**;** suspended solids/particles settle (in lagoon)**;** [**R** sedimentation without reference to particles] reduces sedimentation/turbidity/light penetration problems (in river)**;**	Max 2	AO1+2 3.2.3
8(a)(ii)	root binding/increased interception/wind break/increased OM**;** reduced erosion/runoff/dust/landslides/increased stability**;** reduced aesthetic impact**;** detail of method**;** eg hides spoil heap, blends into landscape, mixed age/species structure	Max 2	AO1+2 3.2.3
8(a)(iii)	reflects/deflects/absorbs (sound)**;** reduced noise/nuisance**;**	2	AO1+2 3.2.3
8(a)(iv)	particles become heavier/stick together/increases cohesion/clumps**;** dust reduced/settles**;**	2	AO1+2 3.2.3
8(b)	pH meter**;** calibrated**;** **or** universal indicator/pH indicator paper/solution**;** colour chart/comparison/colorimeter**;** [**R** litmus, reference to choice of only two colours]	2	AO3 3.2.4
Total		**10**	

Question	Answers	Mark	AO / Spec. Ref.
9(a)	positive correlation**;**	1	AO3 3.2.3
9(b)	Tüllgren funnel**;** light**;** heat**;** soil sample below**;** organisms repelled/move down/pass through mesh**;** collected (in container)**;** **or** sieving/filtration/flotation**;** hand sort**;** pooter**;** collected (in container)**;** **or** Baermann funnel**;** wrapped sample**;** water/collection fluid**;** saturate/flood soil**;** organisms move down**;** collected (in container/from pipe)**;**	Max 4	AO3 3.2.4

Question	Answers	Mark	AO / Spec. Ref.
9(c)	method to control conditions (for living organisms)**;;;** eg ploughing drainage irrigation liming addition of DOM/manure/sewage sludge [**A** humus] don't use (toxic) agrochemicals zero tillage effect on conditions (that affect living organisms)**;;;** eg aeration water content pH control DOM food/energy for organisms (agrochemicals) don't kill biota named organisms linked to process affecting fertility**;;;** eg nitrifying bacteria/Nitrosomonas/Nitrobacter nitrogen fixing bacteria/Azotobacter detritivores/insects/millipedes/woodlice denitrifying bacteria/Pseudomonas decomposers/bacteria/fungi mycorrhizal fungi worms process/effect of action of living organisms on fertility**;;;** eg nutrient release/availability nitrogen fixation/ammonium production nitrite release/ammonium to nitrate nitrate release/nitrite to nitrate decomposition/breakdown of DOM humus increased drainage/reduced flooding more aerobic/oxygenation (drainage/decomposition) creates more neutral pH	Max 8	AO2 3.2.3

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<tr><td>9(c) cont…</td><td>Quality of Written Communication
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<tr><th>Mark</th><th>Descriptor</th></tr>
<tr><td>2</td><td>All material is logically presented in clear, scientific English and continuous prose. Spelling, punctuation and grammar are almost always correct. Technical terminology has been used effectively and accurately throughout. At least half a page of material is presented.</td></tr>
<tr><td>1</td><td>Account is logical and generally presented in clear, scientific English and continuous prose. Minor errors occur in spelling, punctuation and grammar. Technical terminology has been used effectively, and is usually accurate. At least half a page of material is presented.</td></tr>
<tr><td>0</td><td>The account is generally poorly constructed and often fails to use an appropriate scientific style to express ideas. Spelling, punctuation and grammar contain many errors.</td></tr>
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