



**General Certificate of Education
January 2011**

Environmental Studies

ENVS2

Unit 2 The Physical Environment

Mark Scheme

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.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

Copyright © 2011 AQA and its licensors. All rights reserved.

COPYRIGHT

AQA retains the copyright on all its publications. However, registered centres for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to centres to photocopy any material that is acknowledged to a third party even for internal use within the centre.

Set and published by the Assessment and Qualifications Alliance.

Environmental Studies

January 2011

ENVS2

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

Question 1

	Answers	Mark
1	<p>The diagram shows a water cycle with the following components and flows:</p> <ul style="list-style-type: none"> Top Left Box: Contains the answer "0.001 %". Top Right Box: Contains the answer "2 %". Bottom Left Box: Contains the answer "97 %". Bottom Right Box: Contains the answer "biota". Central Box: An empty box representing the ground or soil. Evaporation: An arrow labeled "evaporation" points from the 97% box to the 0.001% box. Precipitation: An arrow points from the 0.001% box to the 2% box. Runoff: An arrow points from the 2% box to the 97% box. Infiltration: An arrow points from the 2% box to the central box. Transpiration: An arrow points from the central box to the 97% box. Biota: The "biota" box has arrows pointing to and from the central box, and an arrow pointing to the 2% box. 	5
Total		5

Question 2

	Answers	Mark
2(a)(i)	Wet soil mass = 27.35 – 8.45 = 18.9 mass drop = 27.35 – 18.45 = 8.9; % mass change = 8.9 x 100/18.9 = 47.0 to 47.1%; [A if candidate rounds answer to 47%]	2
2(a)(ii)	Dry soil mass = 26.78 – 8.96 = 17.82 mass drop = 26.78 – 21.99 = 4.79; % mass change = 4.79 x 100/17.82 = 26.8 to 26.9%; [A if candidate rounds answer to 27%]	2
2(b)(i)	Sealed/in a bag/cool/prevent water loss;	1
2(b)(ii)	Desiccator/keep dry/humidity low/prevent moisture gain;	1

Question 2 continued

	Answers	Mark
2(c)	<p>Method 1; how method works;</p> <p>Method 2; how method works;</p> <p>Method 3;</p> <p>eg landscaping/reduced slope angle/regraded/flatten out/spread runoff slower/shearing reduced</p> <p>organic matter incorporated soil particle cohesion increased/stick together</p> <p>addition of fertiliser/nutrients/lime/pH control <u>increased</u> growth/root binding</p> <p>compaction increased cohesion/lower water content/soil particles stick together</p> <p>drainage control/terracing/runoff collection/redirection reduced lubrication/saturation/soil mass</p> <p>toe foot support/retaining wall barrier to movement/reduces shearing (stress)/prevents basal erosion</p> <p>ground anchors/piles/poles and net/mesh holds spoil together/allows plants to grow through</p> <p>[R method if description is contradictory]</p>	MAX 4
Total		10

Question 3

	Answers	Mark
3(a)(i)	Soil sample in middle/lower container/above funnel/below light; light/heat; time; organisms repelled/move away (from light/heat); [R movement due to gravity] through grill/mesh/filter/seive; collected (in container); preservative/named preservative; named taxon;	MAX 4
3(a)(ii)	Not mobile/too slow; too large/big to pass through holes/grill/mesh/filter; [R too large to enter funnel] desiccation/die; not repelled by/attracted to light/heat/dryness; named taxon;	MAX 2
3(b)	EITHER multiple/many samples; addition of distilled water; pH meter; calibration; OR multiple/many samples; add distilled water; barium sulfate addition; pH papers/solution/universal indicator; colour comparison/reference to range of colours; [R litmus papers/red-blue]	MAX 3
3(c)	pH 4.4 to pH 7.0;	1
Total		10

Question 4

	Answers	Mark
4(a)	Chlorine; iodine; boiling; ozone;	MAX 2
4(b)	<p>Treatment process 1; related water quality issue; description of process; max 2</p> <p>Treatment process 2; related water quality issue; description of process; max 2</p> <p>eg screening [R filters] large solids trapped on screens</p> <p>flocculation/coagulation clay/fines/electrically charged particles addition of named flocculant/coagulant, eg alum, aluminium sulfate, polyelectrolytes, starch/neutralisation of charges</p> <p>sedimentation turbidity/suspended solids allowed to stand</p> <p><u>activated</u> carbon pesticides/organic chemicals adsorption</p> <p>aeration metals/colours oxidation/reduced solubility (of metals)</p> <p>denitrification nitrates reduction</p> <p>ion exchange ion removal adsorption</p> <p>sterilisation/addition of chlorine/iodine/ozone/UV pathogens/bacteria/micro-organisms toxic chemical/light</p>	MAX 4

Question 4 continued

	Answers	Mark
4(c)(i)	Stores (surplus) water (to prevent flooding) and release later (to prevent low flow);	1
4(c)(ii)	<p>Reduced sediment load/turbidity/deposition; sediment dropped in reservoir; temperature/temperature fluctuation; river water from warmer/colder reservoir; oxygenation/dissolved oxygen; lower from decay/higher from turbulence; <u>effect</u> on named taxon <u>downstream</u> of reservoir; eg <u>fewer</u> trout downstream <u>how</u> taxon affected by reservoir; eg cannot reach breeding sites upstream [R migration barrier with no explanation] channel cross section shape/change; justified change in erosion; eg increased due to reduced sediment load/reduced due to lower peak velocity less/more pollutants in river as retained by/released from reservoir; named pollutant; eg particulates, pesticides, fertilisers, heavy metals</p>	MAX 3
Total		10

Question 5

	Answers	Mark
5(a)	Photosynthesis/respiration/decomposition; correct description of different seasonal rates; [R reference to fossil fuels and combustion] [R respiration if it refers to using/taking up CO ₂]	2
5(b)(i)	Increased absorption of IR; [R radiation] (conversion to) heat/temperature rise;	2
5(b)(ii)	Methane; CFCs; NOx; <u>tropospheric</u> O ₃ ; water vapour; dimethyl sulfide/sulfur oxides;	MAX 2
5(c)	Positive: increase of original effect; change in named processes; eg temperature increased, increased rate of decay, more CO ₂ released, temperature increased temperature increased, more forest fires, more CO ₂ released, temperature increased temperature increased, permafrost melts, more methane released, temperature increased temperature increased, land ice melts, albedo reduced, temperature increased Negative: rebalance/reduce original effect; change in named processes; eg more CO ₂ released, more photosynthesis, more CO ₂ absorbed increased temperature, increased evaporation, increased cloud cover, increased albedo/light reflection, decreased temperature	4
Total		10

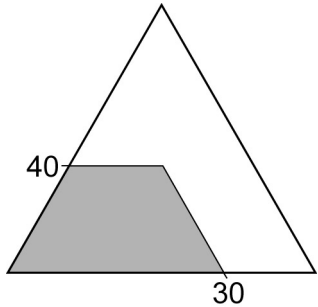
Question 6

	Answers	Mark
6(a)	Negative correlation/decreases over time; small decline/stable (to about 1974); increasing rate of decline (after about 1974); fluctuations (around trend);	MAX 2
6(b)	Measure of variability/confidence (in each mean); [A gives an indication of the distribution/spread of results around each mean eg small standard deviation equals higher confidence in the mean] [R highest and lowest values/or total range]	1
6(c)	CFCs; chemical reactions (words or equations);; absorption of UV by CFC/CFC broken down by UV release of chlorine from CFC reaction of chlorine with O/O ₃ reaction of ClO with O/O ₃ release of Cl from ClO ₂ [R ozone dynamic equilibrium equation]	3
6(d)	Montreal (Protocol) (ignore reference to Kyoto); reduced/banned production/use (of ODSs); named alternative material/HCs/HFCs/HCFCs/alcohols;; named alternative process/pump action/trigger pack; named waste disposal technique/incineration; eg recycle/drain CFCs from fridges [R reference to landfill disposal]	MAX 4
Total		10

Question 7

	Answers	Mark
7(a)	Subsidence/reduced support; [A pores collapsing]	1
7(b)	Recharge/replenishment/pumping down/infiltration lagoon;	1
7(c)	<p>EITHER Reverse osmosis/desalination; high pressure; high energy input; <u>partially/selectively/semi</u> permeable membrane; [A water passes through filter/membrane but salt does not]</p> <p>OR distillation/flash evaporation; high temperature/low pressure; boiling; condensation;</p>	MAX 3
7(d)	<p>Changed behaviour;; eg shower instead of bath shorter showers/smaller baths/turn off taps full wash in washing machine/dishwasher water meter/conservation encouraged by pricing</p> <p>water saving equipment;; eg low water use dishwasher/washing machine hippo bags automatic sensor/timed/manual pump taps/flush spray taps</p> <p>reduced losses;; eg domestic appliance maintenance pipe leak reduction</p> <p>low quality uses of untreated water;; eg dual supply rainwater collection for named use grey water reuse</p>	MAX 5
Total		10

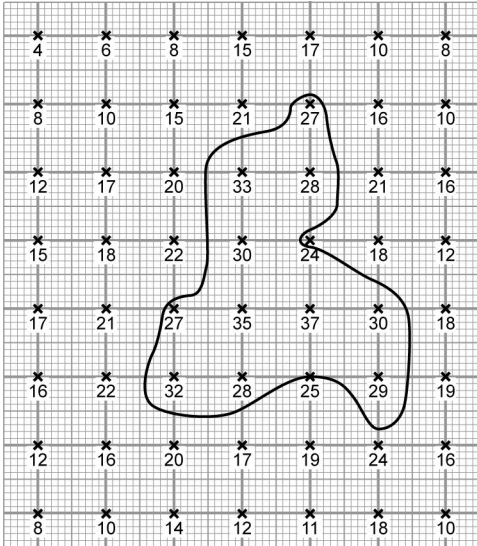
Question 8

	Answers	Mark
8(a)	<p>Named ped/structure/description of ped feature; eg crumb/block/plate/shape and size</p> <p>property affecting fertility; eg drainage/leaching/nutrient content/nutrient release/water content/aeration/root penetration/ temperature/ thermal capacity</p> <p>[R reference to properties caused by texture/sand/silt/clay]</p>	2
8(b)	<p>EITHER</p> <p>Sieves/filters; dry soil; shake; ref to sequence different sizes of holes; ref to order of sand, silt, clay (in sieve stack); mass/volume percentage calculation;</p> <p>OR</p> <p>sedimentation: water; shake; settle; ref to order of (settling of) sand, silt, clay; mass/volume percentage calculation;</p>	MAX 3
8(c)	<p>Correct shading;</p> 	1

Question 8 continued

	Answers	Mark
8(d)	Named particle type; how texture directly affects: drainage/permeability; porosity; leaching; capillary action; water content; nutrient content; aeration; decomposition rate; aerobic biota; temperature/thermal capacity; erodibility; friability/ease of cultivation/root penetration; particle charges/attraction;	MAX 4
Total		10

Question 9

	Answers	Mark
<p>9(a)</p>	<p>Correct line;</p>  <p>[A line between correct values on grid]</p>	<p>1</p>
<p>9(b)</p>	<p>Ore body distribution/fragmented/irregular shape; chemical form/difficulty of chemical extraction; <u>named</u> land use conflict/local opposition; ease of site access; <u>named</u> overburden property/hard/loose; depth of deposit/overburden thickness; drainage difficulties; seismic problems; infrastructure problems; eg transport, energy, water workforce availability/cost; political/<u>named</u> economic problems; <u>named</u> technological problem;</p> <p>[R ore purity]</p>	<p>MAX 4</p>

<p>9(c)</p> <p>Igneous; named eg; igneous processes;;; eg tectonic/plate movements magma/molten rock extrusive/intrusive batholith rate of crystallisation hydrothermal solubility temperature contact metasomatism magmatic segregation</p> <p>metamorphic; named eg; metamorphic processes;;; eg changing form of existing rock intense heat intense pressure source of heat/pressure</p> <p>sedimentary; named eg; sedimentary processes;;; eg weathering/erosion (of existing rock) wind deposited alluvial sorting placer deposits evaporite biological deposits compaction cementation chemical precipitation</p>	<table border="1" data-bbox="316 1480 1267 1921"> <thead> <tr> <th data-bbox="316 1480 437 1518">Mark</th> <th data-bbox="437 1480 1267 1518">Descriptor</th> </tr> </thead> <tbody> <tr> <td data-bbox="316 1518 437 1653">2</td> <td data-bbox="437 1518 1267 1653">All material is logically presented in clear, scientific English and continuous prose. Technical terminology has been used effectively and accurately throughout. At least half a page of material is presented.</td> </tr> <tr> <td data-bbox="316 1653 437 1854">1</td> <td data-bbox="437 1653 1267 1854">Account is logical and generally presented in clear, scientific English. Minor errors occur in spelling, punctuation and grammar. Technical terminology has been used effectively, and is usually accurate. Some minor errors. At least half a page of material is presented.</td> </tr> <tr> <td data-bbox="316 1854 437 1921">0</td> <td data-bbox="437 1854 1267 1921">The account is generally poorly constructed and often fails to use an appropriate scientific style to express ideas.</td> </tr> </tbody> </table>	Mark	Descriptor	2	All material is logically presented in clear, scientific English and continuous prose. Technical terminology has been used effectively and accurately throughout. At least half a page of material is presented.	1	Account is logical and generally presented in clear, scientific English. Minor errors occur in spelling, punctuation and grammar. Technical terminology has been used effectively, and is usually accurate. Some minor errors. At least half a page of material is presented.	0	The account is generally poorly constructed and often fails to use an appropriate scientific style to express ideas.	<p>MAX 8</p> <p>2</p>
Mark	Descriptor									
2	All material is logically presented in clear, scientific English and continuous prose. Technical terminology has been used effectively and accurately throughout. At least half a page of material is presented.									
1	Account is logical and generally presented in clear, scientific English. Minor errors occur in spelling, punctuation and grammar. Technical terminology has been used effectively, and is usually accurate. Some minor errors. At least half a page of material is presented.									
0	The account is generally poorly constructed and often fails to use an appropriate scientific style to express ideas.									
<p>Total</p>		<p>10</p>								