Version 1.0

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.

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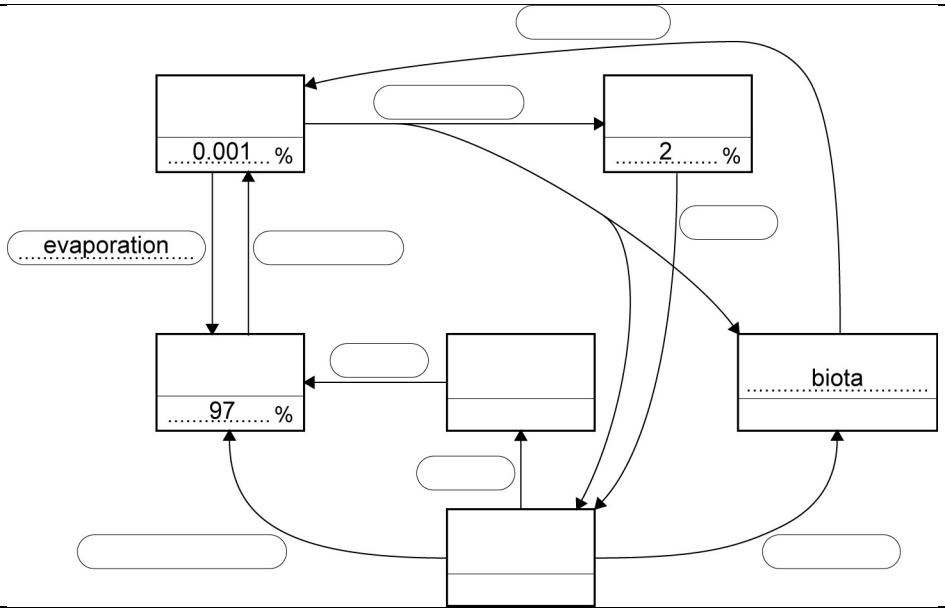
Environmental Studies

January 2011 **ENVS2**

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

Question 1

	Answers	Mark
1		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)	Method 1**;** how method works**;** Method 2**;** how method works**;** Method 3**;** **eg** landscaping/reduced slope angle/regraded/flatten out/spread runoff slower/shearing reduced organic matter incorporated soil particle cohesion increased/stick together addition of fertiliser/nutrients/lime/pH control increased growth/root binding compaction increased cohesion/lower water content/soil particles stick together drainage control/terracing/runoff collection/redirection reduced lubrication/saturation/soil mass toe foot support/retaining wall barrier to movement/reduces shearing (stress)/prevents basal erosion ground anchors/piles/poles **and** net/mesh holds spoil together/allows plants to grow through [**R** method if description is contradictory]	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)	Treatment process 1; related water quality issue; description of process; max 2 Treatment process 2; related water quality issue; description of process; max 2 **eg** screening [**R** filters] large solids trapped on screens flocculation/coagulation clay/fines/electrically charged particles addition of named flocculant/coagulant, eg alum, aluminium sulfate, polyelectrolytes, starch/neutralisation of charges sedimentation turbidity/suspended solids allowed to stand <u>activated</u> carbon pesticides/organic chemicals adsorption aeration metals/colours oxidation/reduced solubility (of metals) denitrification nitrates reduction ion exchange ion removal adsorption sterilisation/addition of chlorine/iodine/ozone/UV pathogens/bacteria/micro-organisms toxic chemical/light	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)	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; effect on named taxon downstream of reservoir; eg fewer trout downstream how 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	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**

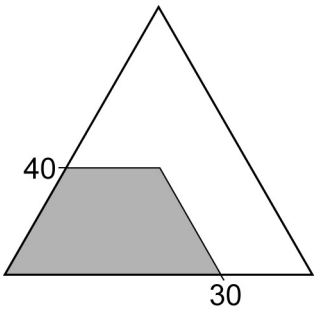
Question 6

	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)	**EITHER** Reverse osmosis/desalination; high pressure; high energy input; partially/selectively/semi permeable membrane; [**A** water passes through filter/membrane but salt does not] **OR** distillation/flash evaporation; high temperature/low pressure; boiling; condensation;	MAX 3
7(d)	**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 **water saving equipment;;** **eg** low water use dishwasher/washing machine hippo bags automatic sensor/timed/manual pump taps/flush spray taps **reduced losses;;** **eg** domestic appliance maintenance pipe leak reduction **low quality uses of untreated water;;** **eg** dual supply rainwater collection for named use grey water reuse	MAX 5
Total		**10**

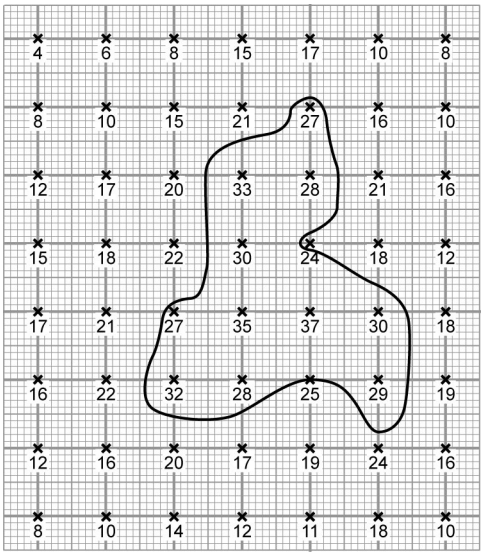
Question 8

	Answers	Mark
8(a)	Named ped/structure/description of ped feature; eg crumb/block/plate/shape and size property affecting fertility; eg drainage/leaching/nutrient content/nutrient release/water content/aeration/root penetration/ temperature/ thermal capacity [**R** reference to properties caused by texture/sand/silt/clay]	2
8(b)	**EITHER** 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; **OR** sedimentation: water; shake; settle; ref to order of (settling of) sand, silt, clay; mass/volume percentage calculation;	MAX 3
8(c)	Correct shading;  	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
9(a)	Correct line;  [**A** line between correct values on grid]	1
9(b)	Ore body distribution/fragmented/irregular shape; chemical form/difficulty of chemical extraction; named land use conflict/local opposition; ease of site access; named overburden property/hard/loose; depth of deposit/overburden thickness; drainage difficulties; seismic problems; infrastructure problems; eg transport, energy, water workforce availability/cost; political/named economic problems; named technological problem; [**R** ore purity]	MAX 4

9(c)

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

metamorphic;
named eg;
metamorphic processes;;;
eg
changing form of existing rock
intense heat
intense pressure
source of heat/pressure

sedimentary;
named eg;
sedimentary processes;;;
eg
weathering/erosion (of existing rock)
wind deposited
alluvial
sorting
placer deposits
evaporite
biological deposits
compaction
cementation
chemical precipitation

MAX 8

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.

2

Total **10**