GCE 2005
January Series

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark Scheme

Environmental Science – ESC2

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

Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales 3644723 and a registered charity number 1073334. Registered address AQA, Devas Street, Manchester. M15 6EX. *Dr Michael Cresswell Director General*

January 2005 **ESC2**

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

Question 1

Land reclamation technique	Reason	
Liming/calcium carbonate ($CaCO_3$) [**R** neutralise/fertilise]		;
Ploughing/ripping/tilling [**R** add worms]		;
	Fix/add nitrogen/NO_3^-/NH_3/NH_4^+/OM	;
	Reduce risk of landslip/erosion/run-off/ easier reclamation/construction [**R** leaching ref]	;
	Encourage growth/add increase OM/ provide ground cover/revegetate/stabilise slopes/decrease erosion [**R** increase nutrients]	;

5

Total marks = 5

Question 2

(a) **A** clay;
B silt;
C sand; 3

(b) Proportions/% of sand, silt and clay;
remove litter; 1

(c) Remove litter;
add water and allow to settle;
measure layers;
OR
Remove litter;
dry and sieve;
weigh samples; 2
1 mark for 'hand test'

(d) pH:
affects solubility/supply/cation exchange;
of named nutrients/minerals;
toxic/damage to roots;
affects invertebrates/decomposers/decomposition/biota;
reduces OM; Any 2

Aeration:
oxygen;
needed for active uptake/nitrification;
root penetration;
drainage/H_2O entry/movement;
movement of (named) ions/nutrients;
correct activity/number of invertebrates/decomposers/biota; Any 2 4
[**R** ref to compaction]

Total marks = 10

Question 3

(a) Breakdown/disintegration/decomposition of rocks;
in situ;
produce regolith/solutes;
[**R** erosion] 2

(b) (i) Chemical weathering; 1

(ii) (Strong) physical weathering/freeze-thaw; 1

(c) (i) Water needed; 1

(ii) Breaks up rock;
increases surface area (for chemical reactions)/named chemical weathering process; 2

(d) Burrowing/churning/mixing;
plant roots growing through/splitting rock;
chelation/decomposition of D.O.M;
roots releasing acids;
dissolves rocks;
hydrolysis;
roots/fungi/lichen absorbing elements from rock;
(respiration/organisms) release CO_2;
to form carbonic acid/H_2CO_3;
ref to anthropogenic pollution/example of; MAX 3

Total marks = 10

Question 4

(a) Equal time;
equal samples of litter/soil;
samples collected at same time/same depth;
equal wattage of bulbs;
equal distance from bulb;
repetitions;
equal mesh/funnel size; MAX 2

(b) (i) Weigh soil sample;
dry in oven/90 – 120 ºC;
[**R** bunsen burner]
to constant mass/weight;
reweigh;
difference/original mass × 100 = / %; MAX 4

(ii) Less litter;
more incorporation/mixing (by detritivors);

More organic matter;
ref. to breakdown/decomposition/decay (of extra litter);

faster drainage/less moisture;
burrowing/movement/spaces/aerated;

increased pH;
earthworms egest material; MAX 4

Total marks = 10

Question 5

(a) Nitrogen fixation;
[**R** Haber Process] 1

(b) (i) Makes available N/NO_3 source for plants/animals;
increases N/NO_3 in soil;
N needed for proteins/DNA/nucleic acids;
named/rhyzobium bacteria are able to convert it; MAX 2

(ii) Ammonium/NH_4^+ ions difficult to absorb;
nitrates can be absorbed/makes N available to plants;
increases fertility; 2

(iii) Loss of nitrogen/nitrates/nutrients;
reduces fertility/growth;
economic loss/pollutant/ref eutrophication/blue baby syndrome/
replace via fossil fuels/Haber Process; MAX 2

(c) Ref dynamic equilibrium;
death/decay/decomposition;
denitrification/NO_x/NH_3 converted to N_2;
burning of fossil fuels/industrial processes;
release of ammonia (e.g. swamps/anaerobic decomposition);
NO_x/NH_3 converted to N_2;
volcanic eruptions; MAX 3

Total marks = 10

Question 6

(a) (i) **C**; 1

(ii) **A/B**; 1

(b) Substitution/alternatives e.g. plastics for metals;
new deposits found;
improved exploitation techniques/new technology;
demand/value/price increase (has made marginal deposits viable)/ref to cut-off grade;
recycling;
alloying metals; MAX 3

(c) Landtake;
destruction of habitat/damage to breeding grounds;
reduced species diversity;
visual pollution/scarring/landscape loss;
noise pollution;
named air pollution – transport/machinery;
dust;
turbidity;
water pollution – heavy metals/leachates/acid mine drainage;
flooding/decrease in water table;
aesthetic damage e.g. in National parks/loss of amenity/loss of access;
explosion/blasting;
congestion;
vibration;
subsidence/landslides;
contamination (of top)soil/radiation;
dereliction of land;
named habitat creation;
recreation potential following reclamation;
dredging/sea bed topography change/currents;
coastal erosion;
importation of alien species; MAX 10

Total marks = 15
