



General Certificate of

Environmental Science 5441

ESC2 The Lithosphere

Mark Scheme

2006 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.

Environmental Science

June 2006

ESC2

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

Question 1

Description	Letter
Process which increases carbon dioxide levels in soil	(E)
Product of metamorphosism of shale/clay	F
Conversion of nitrite ions into nitrate ions	I
Term describing level of suspended sediment in water	C
The pH at which most plant nutrients are available	D
Conversion of nitrogen gas into ammonia	B

Total marks = 5

Question 2

- (a) Disintegration/decay/decomposition of rocks/wearing away;
in situ;
produces regolith/solutes; MAX 2
[**R** denudation]
- (b) Ref. to named weathering process;
biota have an effect/carbon dioxide released/organic acids produced/OM;
pollution/acid rain/fertilisers/salt H₂O incursion;
eluviation/illuviation/leaching; MAX 2
- (c) (i) Carbonation; 1
[**R** acid rain]
- (ii) Atmosphere/volcanic eruptions;
decay of OM/respiration;
combustion; MAX 2

- (iii) Named weathering;
washed/blown/eroded/transported;
absorption/assimilation/ingestion;
correct ref. to carbonate ions CO_3^- HCO_3^- ;

OR

- gaseous loss/ref to CO_2 ;
solution/dissolved;
absorption/assimilation/ingestion;

MAX 3

Total marks = 10

Question 3

- (a) Biota/OM/humus/decomposers; 1
[R leaf litter]
- (b) Oxygen for respiration;
drainage/holds more water/permeability/doesn't saturate;
easier to cultivate;
allows root growth;
soil warms up quicker (in spring);
(organic) decomposition/detritivores;
 N_2 for nitrates/fixation; MAX 2
- (c) (i) C; 1
- (ii) (Largest % of) smallest particles; 1
[A fine]
- (d) (i) Ref. to pore/particle size;
(sands) well drained;
(clays) poorly drained/prone to waterlogging/retain water;
silts intermediate; MAX 2
- (ii) Clays adsorb minerals/have/hold more nutrients;
may be difficult for roots to absorb;
loams ideal;
sands low;
sands prone to leaching; MAX 2
- (iii) Clays wetter so cooler/affects specific heat capacity/clays heat up/
absorb more heat/cool more slowly/sands have greater temperature range; 1
[A converse]

Total marks = 10

Question 4

- (a) (i) Need samples in woodland;
more samples/different times of year;
deeper pits/bigger samples;
repetition/replicate pits; MAX 2
- (ii) $7000 \text{ in } 1\text{m}^3 = 7000 \text{ in } 1\,000\,000 \text{ cm}^3$
Thus, in $10 \times 10 \times 10 = 1000$ therefore $\frac{7000}{1000} = 7$; 1
- (b) Ref. to statistical significance;
didn't measure leaf litter;
OM could have come from alternative source/sheep/be a consequence of
farmer not being able to cut grass near woodland;
 H_2O content influenced by other factors (OM/interception)/did not measure
 H_2O content of leaves;
difference between sites small/could be due to sampling error/chance;
sites B/C/D do not support earthworm/OM link;
sites A/B do not support H_2O content/OM link;
no refs to pH; MAX 4
- (c) Mix/churn;
increase the pH;
increase moisture content;
increase surface area of OM/leaves/break OM up;
ref. to gums being released;
(improve) structure/peds/help stick soil together OWTTE;
ref. (improve) aeration; MAX 3
[R sort]

Total marks = 10

Question 5

- (a) (i) Named conflict/ref. to planning;
advocate/opponents put their cases;
in a public setting/open to public;
inspector decides/reports/passes to Secretary of State; MAX 2
- (ii) Monetary value of all aspects considered;
if $B > C$ (may go ahead)/converse/ref. to net figure; 2
- (iii) Surround urban areas;
restricts development/protect farmland/countryside;
prevent towns merging;
prevent historic towns being lost;
stop urban sprawl; MAX 2

- (b) Charges:
raise revenue;
reduce cars/congestion/pollution/encourage walking/public transport/
stop new residents using car park;
reduce noise/danger;

OR

Tree planting on ridges:
screen/reduce visual impact/maintain aesthetics;
reduce noise;
ref. to psychological carrying capacity/sense of privacy;
ref. carbon neutral;

OR

Bends:
hide visitors/ref. to psychological carrying capacity;
increase visual interest/allows visitors to see more;
slow traffic/calming/reduce danger/R.T.As/wildlife mortality/
reduce parking on bends; MAX 2 + MAX 2

MAX 4

Total marks = 10

Question 6

- (a) Granite;
hard/resistant/durable/strong/road grip;
roadstone/kerbs/cladding/building/statues;
[R tough]
- limestone;
kali/chem. reactive/can be ground finely/easy to cut/carve/shape/sculpt/attractive;
cement/glass/agric use/smelting/neutralising agent/building;
- sand;
inert/compound of silica;
filler/concrete/mortar/glass;
- gravel;
inert;
filler/construction/concrete;
- clay;
hard when baked/non-porous/poor conductor of heat;
bricks/pottery;
- china clay/kaolin;
inert/non-toxic;
waterproof/non-porous;
forms hard/smooth surface/fine/can be polished/pure white;
pottery/paper/named pharmaceuticals/paint/cosmetics/plastics/filler;
- coal;
high calorific value;

fuel/power stations;
 uranium;
 radioactive/fissile;
 power stations;

slate;
 fissile non-porous;
 roofs;

sandstone;
 easily crushed/graded;
 road filler;

MAX 3 + MAX 3

MAX 6

(b) *Quality of Written Communication is assessed in this answer.*

Mining costs/depth of veins/seams/thickness of overburden;
 size of deposit;
 dispersal of veins/seams
 nature of overburden eg granite v clay/exploitable overburden;
 drainage problems;
 folding/faulting/seismic activity;
 land costs;
 cost of reclamation/pollution prevention/CH₄ pockets;
 infrastructure/roads/transport costs/site accessibility;
 processing costs/purity of ore/grade of ore/level of technology available;
 [R quality]
 chemical form;
 (market) demand/cut-off grade;
 labour costs;
 public opposition/NIMBY;
 designations eg NP/SSSI;
 political instability;

MAX 7

Quality of Written Communication

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. 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.

MAX 2

Total marks = 15