

GCE 2004  
*June Series*



## Mark Scheme

### Environmental Science – ESC2 (5441 )

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**Environmental Science****June 2004****ESC2****Instructions: ; = 1 mark / = alternative response A = accept R = reject****Question 1****B;****I;****L;****A;**

4

**Total marks = 4****Question 2**

- (a) (i) Igneous; 1  
[A named rocks]  
[R volcanic]
- (ii) (Intense) heat/pressure; 1
- (iii) Marble; 1
- (b) (i) Carbonic acid; 2  
[A ref to acid]  
reacts with OWTTE dissolving/attacking minerals/rocks;  
[R refs to erosion]
- (ii) Uptake of water by rocks/chemical binding of water to minerals; 2  
increasing volume/swelling/increasing surface area (of rock/min);  
[R formation of ions = hydrolysis]  
[R weather as implicit in question]

**Total marks = 7**

**Question 3**

- (a) Structure; 1
- (b) How particles fit/join together/ref to peds; 1  
[R mixing]
- (c) Determines nutrient solubility/availability/cycling/most available in slightly acid soil/pH6.5; MAX 4  
refs to leaching;  
refs to weathering;  
ref to ion exchange;  
influences invertebrates/named invertebrates/detritivores/biota;  
burrowing/aeration/organic matter;  
influences decomposition/microbes/named bacteria/attacks humus;  
[R pH6.5 incr soil fertility]
- (d) Decreased interception; MAX 3  
increased raindrop impact/rainsplash;  
increased overland flow/flooding/soil wash/run-off;  
loss of root binding;  
less organic matter/litter/humus;  
ref to soil drying out/dust/wind erosion;  
ref to compaction/trampling;  
[R less protection/exposure]

**Total marks = 9****Question 4**

- (a) Pottery/ceramics/tiles; MAX 2  
paper (filler);  
pharmaceuticals/named medicines/cosmetics;  
paint;
- (b) Depth; MAX 2  
dispersal;  
nature of overburden e.g. granite v clay;  
drainage;  
land costs;  
cost of reclamation;  
environmental impacts;  
qualified transport costs/site accessibility/infrastructure;  
purity/processing costs/grade;  
[R quality]  
demand/cut-off grade;  
public opposition/NIMBY;  
designations e.g. NP, SSSI;

- (c) (i) Habitat loss/landtake;  
[R destroy environments]  
dust;  
noise;  
eyesore/scarification;  
suspended sediment/turbidity/contamination of groundwater;  
health and safety issues of quarry/tailings ponds;  
[R aesthetic] MAX 2
- (ii) Filler(inert)/construction/driveways/roads/building;  
concrete;  
nourishment of beaches;  
[R aggregates, cement, glass] MAX 2
- (iii) Reclamation/reduce (transport) costs/screening/mining  
agreements/legislation; 1  
[R for other uses]
- Total marks = 9**
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**Question 5**

- (a) Insufficient number of sites/samples;  
arbitrary samples/uneven/none at top;  
depth not same;  
sample tool not same;  
moisture may have escaped/ref to storage;  
no replications; MAX 4
- (b) Pestle and mortar/break up soil;  
weigh soil (in container);  
dry in oven without burning/at suitable temperature (90° - 130°, @ 105°C);  
to constant mass;  
cool;  
reweigh soil (in container);  
difference/original mass  $\times 100 = \% \text{ OWTTE}$ ;  
ref to soil moisture probe = 1 mark MAX 4

**Total marks = 8**

**Question 6**

- (a) 1. Decrease/control visitor numbers/overcrowding;  
prevent carrying capacity being exceeded;  
encourage public transport;  
reduce congestion/NO/N<sub>2</sub>O/NO<sub>2</sub>/NO<sub>x</sub>/VOCs/particulates/lead/traffic noise;  
money;  
for park management projects or example of; MAX 2
2. Increase landscape diversity;  
return to natural/original/native/historic landscape/vegetation;  
more money for farmers by diversification;  
enhance amenity/recreation;  
attract/absorb more visitors;;  
create habitats/aid wildlife;  
increase species diversity/biodiversity;  
prevent soil erosion/floods;  
CO<sub>2</sub> sink; MAX 2
3. Allow vegetation/habitat recovery;  
[R recovery of area/paths]  
reduce erosion/compaction/trampling;  
reduce disturbance to wildlife;  
repair existing paths;  
reduce psychological carrying capacity; MAX 2
- (b) (i) Cost benefit analysis/CBA; 1
- (ii) Ask visitors/people/residents how much they would pay to maintain it/view it;1

**Total marks = 8**

**Question 7**

- (a) Detection of (named) objects/features/land use/landscape;  
without coming into contact/from distance/space;  
via hi-tech equipment/satellites/sonar/lasers/aerial photos/GIS; MAX 2
- (b) (i) Other/best land used for agriculture/trees can withstand conditions here (ref to  
climate/soils); 1  
[A converse]  
[R conifers prefer uplands/upland conditions]
- (ii) Increased commuting/car ownership/living standards/affluence/response to  
congestion/industrial (tertiary industry use road not rail) or commercial  
imperative e.g. freight, rail to road/increasing urbanisation;  
ref. food miles; 1
- (c) Causes
- Abandonment/relocation/closure of factories/industries/mines;  
transport charges/new roads/rail station closure/higher transport costs/bypasses/canals;  
crime/vandalism/terrorism;  
social deprivation/antisoc housing/decay/highrise/inner city problems/unemployment;  
contamination/pollution;  
ref growth of other domestic/international centres;  
instability/subsidence/natural hazards/safety issues “Wigan Alps”;  
legislation for minimum housing standards/petrol stations etc.; MAX 4

(Max 4 for Causes)

Methods

Pollution absorbing/tolerant plants e.g. London Planes/planting  
vegetation/landscaping/screening;  
add OM/improve structure;  
decontamination/bioremediation e.g. bacterial cultures/Thiobacillus/qualified  
remediation techniques;  
soil removal/bringing in new soil;  
liming;  
increase pH/increase nutrient availability/fertilise;  
hydroseeding – seeds in liquid manure;  
removal/demolition of buildings/machinery;  
reducing slopes/levelling/stabilising/hole filling/ripping/ploughing/draining;  
legumes e.g. lupin, pea, clover, alder;  
creation of new habitats/ponds/lakes/leisure parks/amenities/Country Parks;  
financial incentives/grants/no VAT on brownfields;  
urban regeneration schemes/ref to community action; MAX 7

(Max 7 for Methods)

**Total marks = 15**