

GCE 2004
June Series



Mark Scheme

Environmental Science – ESC3 (5441)

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Dr Michael Cresswell Director General

Environmental Science**June 2004****ESC3****Instructions: ; = 1 mark / = alternative response A = accept R = reject****Question 1**

- (a) (i) 0.03
0.90
2.20; 1
- (ii) Low temperature; enzymes activity reduced therefore rate of photosynthesis reduced;
OR
low light levels; therefore rate of photosynthesis reduced;
OR
high temperature; therefore enzymes denatured/rate of photosynthesis reduced;
OR
low water levels; therefore rate of photosynthesis reduced;
OR
low soil fertility; therefore poor productivity/growth; MAX 2
[A low CO₂ and link]
[A high wind and link]
- (b) Large zones of distinctive vegetation type;
largely determined by climate/latitude; 2

Total marks = 5

Question 2

- (a) Green/blue/violet (yellow); 1
- (b) Supplies energy for process/excites electrons/activates chlorophyll;
equation/explanation of process;
photolysis of water; MAX 2
- (c) Increases enzyme activity;
therefore increase in rate of photosynthesis;
OR
denatures enzymes;
therefore decrease in rate of photosynthesis;
OR
reduced CO₂ solubility;
therefore decrease in rate of photosynthesis;
OR
increases toxicity of pollutants;
therefore decrease in rate of photosynthesis; MAX 2

Total marks = 5**Question 3**

- (a) (i) Carnivores; 1
- (ii) Flow of energy; 1
- (b) (i) $\frac{1.9 - 1.6}{1.6} \times 100$; = 18.75%; 2
- (ii) Partially digested pellets egested/ruminant stomach;
ref to micro-organisms/cellulose digesting enzymes/cellulase;
more food/energy absorbed - qualified; MAX 2

Total marks = 6

Question 4

- (a) Low resistance to disease;
habitat lost;
threat still exists;
tame/dependant on humans;
unable to hunt/or gather food;
unable to avoid predators/poachers; MAX 3
- (b) Prevent inbreeding/close related breeding;
which reduces gene pool/small gene pool;
leads to genetic weaknesses/reduces heterosis; 3
[A positive selection for 1 mark]

Total marks = 6

Question 5

- (a) Succession – time/change in one place;
zonation – spatial/change along an environmental gradient; 2
- (b) Water coverage/exposure; 1
- (c) Belt transect;
from low tide to high tide/HWM to LWM/right angle to shore ;
suitable number of sample points/quadrats at suitable distances;
identify species;
record frequency/percentage of cover/abundance scale;
repeat transect at different points; MAX 5

Total marks = 8

Question 6

- (a) Number of organisms an area can sustainably support; 1
- (b) (i) **A** = increased and **C** = negative; 1
- (ii) **B** = decreased and **D** = negative; 1
- (c) Pollution;
less food;
OR
winds;
nests disturbed;
OR
extreme temperature;
disrupts breeding/move out of area;
OR
drought;
less fish/food/move out of area; MAX 2
[A fire and flooding and qualification]

Total marks = 5

Question 7

- (a) (i) Map/aerial photograph;
calculate area of woodland;
lay out grid;
select suitable sample area e.g. 100 m²;
use random number to locate areas to sample;
select suitable number of sample areas e.g. 10%;
count oak trees in area;
multiply up to area of woodland; MAX 4
- (ii) Random numbers can cluster co-ordinates; therefore area not covered;
OR
oaktrees cluster; therefore populations underestimated/overestimated;
OR
trees not wholly in sample; therefore counted twice;
OR
different ages of trees; difficult to get accurate numbers; 2
- (b) (i) Large number of traps;
non toxic marking;
appropriate time for recapture;
marking not visible to predators;
marking not rubbed off; MAX 2
[A identical procedure for both capture events for 1 mark]
- (ii) $8 \times 11 \div 3$;
 $= 29$; 2
[R 29.3]

Total marks = 10

Question 8

- (a) (i) International importance of rare/unique habitat in need of protection; 1
- (ii) Activity of national importance/military use etc; 1
- (b) Areas where public access is restricted;
prevents trampling of plant species or disturbance of animals nests/burrows;
- designated car parks;
prevents offroad damage by cars parked in sensitive areas;
- designated areas;
contains bird watchers/prevents disturbance to birds/reduces impact on their behaviour;
- designated picnic areas;
control of litter/fires etc;
- designated activity area;
buffer to prevent animal and plant disturbance; 2×2 4
[A ref to bus way/public transport; reduce air polluting]
- (c) Maintenance of atmosphere;
ecological balance/maintenance of species diversity;
maintenance of genetic resource/gene pool;
use of species for food;
use of species for medicines;
use of species for raw materials/industrial products;
ethical/moral/stewardship/duty of care;
beauty/aesthetic reasons;
leisure/recreation/tourism;
scientific research/education/monitoring;
benefit of indigenous people; MAX 9
(Credit relevant expansion examples throughout – maximum one per marking point)

Total marks = 15