



ASSESSMENT and  
QUALIFICATIONS  
ALLIANCE

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# Mark scheme January 2004

## GCE

# Environmental Science

## Unit ESC3

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

**Question 1**

- (a) Water becomes less dense 0 to 4 °C/then increases above 6 °C; 1
- (b) Water freezes from top down/ice floats;  
layer of ice then acts as insulator (to protect organisms lower down); 2  
[R any ref to O<sub>2</sub>]

**Total marks = 3**

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**Question 2**

- (a) Biological/physiographic/geological feature of importance/rare species; 1  
[R landscape]
- (b) Primary succession; 1
- (c) Secondary succession; 1

**Total marks = 3**

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**Question 3**

- (a) (i) Number of individuals (of a species);  
number of individuals in a specified unit area; 2
- (ii) Encouragement of sterilisation/contraception/abortion;  
financial incentive/disincentive;  
legal restraints;  
public education /campaigns;  
control of immigration/emigration; MAX 2
- (b) (i) 6.1; [A 6.0-6.2] 1
- (ii) 3.8; [A 3.8-4.0] 1
- (iii) Large pop. of old people/small workforce;  
old people need medicine/welfare/pensions;  
small workforce – high financial burden/taxes/industrial problems; MAX 2

**Total marks = 8**

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#### Question 4

- (a) Decomposers breakdown dead organic matter/dead organisms/wastes;  
no release of nutrients/biogeocycles stop/no recycling of nutrients; MAX 2
- (b) (i) Keep same;  
leaf species/age/condition;  
disc size/surface area;  
disc numbers/mass;  
depth of burial;  
time of burial;  
time of year;  
soil conditions/temperature/moisture/pH/same location/same soil type;  
repeats carried out; MAX 4  
[R size of bag]
- (ii) Bigger mesh size more decomposition;  
bigger mesh size allows the larger detritivores access;  
earthworms/detritivores needed to physically breakdown matter/increase  
surface area/make smaller pieces;  
decomposers complete chemical breakdown/release nutrients; 4

**Total marks = 10**

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#### Question 5

- (a) Organisation: English Nature/SNH/CCW/D.ENI/ RSPB/Local Authorities/National Trust;  
Purpose: to protect areas of natural/semi natural vegetation and fauna/conservation of  
communities/rare habitats; 2
- (b) (i) More seedlings/m<sup>2</sup> initially, the greater % underdeveloped plants;  
(intraspecific) competition;  
for nutrients/space/water/light; 3
- (ii) Density dependent: nutrients/space/water/light/disease/predator;  
density independent: extreme weather change e.g. heat, storm, drought; 2  
[A ref to trampling by visitors/grazing etc.]

**Total marks = 7**

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### Question 6

- (a) Qualified change for each named population  $\times 3$
- (i) Increased population;  
reduced grazing/consumption/predation by mayfly;
  - (ii) Increased population;  
less competition for food/more food available;
  - (iii) Decreased population;  
less food for its prey – water boatmen;  
**OR**  
Increased population;  
more food available;  
**OR**  
No change;  
plenty of available food; MAX 6
- (b) (i) Kick-sweep/catch using suitable technique/net;  
select suitable sites;  
work up stream;  
disturb sediment;  
identify;  
count;  
repeat; MAX 4
- (ii) Many escape/difficult to identify/only samples benthic fauna/small area sampled;1
- (iii)  $\frac{76 \times 75}{(156 + 462 + 306 + 506)}$ ; =  $\frac{5700}{1430}$  ;= 3.99; 3
- [A 4.0]

**Total marks = 14**

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### Question 7

- (a) Scarce supply/or increased value;  
makes it more profitable to kill rhino/worth risking being caught/worth more on  
black market; 2
- (b) Limited mates/small gene pool;  
in-breeding occurs;  
loss of heterosis vigour/genetic defects;  
increased risk of catastrophic extinction e.g. diseases/fire/hunting; MAX 3

(c)

<b>Strategy</b>	<b>Example</b>	<b>Explanation/purpose</b>
1 Banning damaging activities e.g.	Poaching	
2 Establishment of protected areas	NNR/SPA/SSSI etc	Aids breeding. Reduces loss via development etc.
3 Management of exploitation	IWC	Sustainable control.
4 Captivity – exsitu conservation	Zoo's Botanic gardens seed banks	Protects and encourages breeding/fertilisation. Maintains gene pool.
5 Artificially increasing breeding success	Captive breeding genetic manipulation sperm/egg/embryo storage	Enables enhanced breeding success. Release into wild when appropriate.
6 Removal of competitors/ predators	Predator control control of exotic species prevention of succession	Maintains population.
5 Habitat management	Raising watertable for wetland species culling to prevent habitat damage bird/bat boxes food supplements ponds etc corridors	Maintains healthy population. Reduces species loss.
6 Education/publicity/volunteer groups/fund raiser	WWF/RSPB etc	Awareness reduces loss. Funds to develop projects.

[A ref to horn removal etc to reduce reason for exploitation]

1 mark for strategy, 1 for example and 1 for explanation/purpose

MAX 10

**Total marks = 15**

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