



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Mark scheme

June 2003

GCE

Environmental Science

Unit ESC4

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

Question 1

- (a) Temperature control by heater/ventilators/glass trapping heat/radiation;
glass reduces escape of moisture/ref to shelter/stops pests/stops wind/
ref sprinklers/irrigation;
[R glass keeps CO₂ in]
CO₂ by burning fossil fuels/paraffin;
lighting can be controlled by blinds/artificial means;
ref to artificial nutrients (in water);

MAX 3

Total marks = 3

Question 2

- (a) High nutrient levels;
why from rivers/upwelling;
[A high food supply]
OR
High temperature/light/photosynthesis;
shallow;
OR
Agitation;
high CO₂;
(Reason 1 mark)
(Explanation 1 mark)
- (b) (i) Ref to warm water/air;
- (ii) Reduces productivity/nutrients;
changes/stops upwelling/currents;

MAX 2

1

2

Total marks = 5

Question 3

- (a) Feature: all same age/species/genotype/high density/can control age, species etc;
Advantage: mature at same time/less weeding/less branching/straighter stems/faster return/high yield/profit/easier marketing/easier management; MAX 2
- (b) (i) Decreased interception;
increased runoff/overland flow/increased flooding/decreased infiltration/water logging;
decreased (evapo)transpiration/humidity; MAX 2
- (ii) Increased rainsplash/raindrop impact;
decreased root binding/decreased OM/increased erosion/soil becomes dust; MAX 2

Total marks = 6

Question 4

- (a) Value of pollinators/traded species/food species/tourism; 1
[R C > profits/ref to profit]
- (b) Not viable/sustainable;
costs > benefits;
ref to declining shrimp productivity/accelerating costs; 3

Total marks = 4

Question 5

- (a) (Plant modified by) insertion of genes/transfer of genes;
from a different species/crop/organism; 2
[A DNA]
- (b) (i) Locally produced/no syringes/refrigeration, easily administered/acceptable to recipient/easier; 1
- (ii) Ethical objection/have to be eaten raw/dose problems/absorption problems/may alter other genes/adverse effect on plant/named organism; 1
[A mutations]

Total marks = 4

Question 6

- (a) As weed density increases biomass decreases/negative correlation; 1
- (b) Competition for water/minerals/light/carbon dioxide; 1
- (c) Specific/only kills the pest or weed;
biodegradable/no residues/not persistent/doesn't accumulate;
fast acting;
cheap;
easy application; MAX 3
- (d) Adds humus/OM/improves structure/improves water-holding capacity;
cheap ∴ waste/ ref to recycling/ref to waste;
slow release/less likely to leach or wash away/decreased eutrophication;
no fossil fuels used in manufacture/less energy used;
[R biodegradable/persistence] MAX 3

Total marks = 8

Question 7

- (a) (i) $1.5/6 = 0.25$
 $2/12 = 0.16$;
[A 0.16 0.166 or 0.17]
difference = 0.09ha per person;
[A 0.08 – 0.09] 2

Give 1 mark if 0.25 or 0.16 given

Give 2 marks if 0.08 - 0.09 alone given (i.e. no working)

- (ii) 1. More cattle/paddy fields so more methane/CH₄;
more fertiliser/mechanisation/fuel use so more CO₂/NO_x;
more soil erosion/burning so more particulates;
more clearance of vegetation so more carbon dioxide;
more use of nitrates so more NO_x; MAX 3
2. More leachates including pesticides so more pollution of
aquifers/rivers;
more fertiliser pollution so more eutrophication/ref to blue baby
syndrome;
more pesticide pollution so more damage to non-target species;
more sediment so increased turbidity;
[A silting so increased turbidity] MAX 3
3. More machinery/livestock so more compaction;
overgrazing/more intensive use of land/use of marginal land so more
erosion/ref to salinisation;
more use of inorganic fertilisers so poorer structure/less OM;
less fallow so more nutrient deficiency; MAX 3
- (b) Population is rising faster than food production/per capita production is falling;
people will starve/ref to desertification/salinisation; 2
- (c) Production increased in both;
world production levelling;
developing countries' production continue to increase; 3
- (d) Greatest quantity that can be harvested indefinitely/year after year/stably; 1
- (e) Cash crops;
subsidies;
transition economies;
exports (despite hunger);
wars;
debt repayments; MAX 3

Total marks = 20

Question 8

- (a) Factors affecting selection of species
 - species availability;
 - suitability for conditions;
 - ease of cultivation;
 - productivity/nutrient content;
 - pest and disease resistance;
 - uniformity;
 - polyploidy;
 - transgenics;

- (b) Need for management – overfishing, economic importance, pollution;
 - fishing quotas;
 - net size/shape/structure;
 - closed seasons;
 - fish size;
 - fleet reduction;
 - MSY;
 - control of stock on farms;
 - pest control;
 - nutrients;
 - waste control;

Total marks = 20

Essay Questions

The essay questions are marked using the following marking criteria.

Scientific content

(maximum 14 marks)

Category	Mark	Descriptor
	14	
Good	12	Most of the material of a high standard reflecting a comprehensive understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A Level study. Some material, however, may be a little superficial. Material is accurate and free from fundamental errors but there may be minor errors which detract from the overall accuracy.
	10	
	9	
Average	7	A significant amount of the content is of an appropriate depth, reflecting the depth of treatment expected from a programme of A Level study. Generally accurate with few, if any fundamental errors. Shows a sound understanding of most of the principles involved.
	5	
	4	
Poor	2	Material presented is largely superficial and fails to reflect the depth of treatment expected from a programme of A Level study. If greater depth of knowledge is demonstrated, then there are many fundamental errors.
	0	

Breadth of Knowledge

(maximum 2 marks)

Mark	Descriptor
2	A balanced account making reference to most if not all areas that might realistically be covered by an A Level course of study.
1	A number of aspects covered but a lack of balance. Some topics essential to an understanding at this level not covered.
0	Unbalanced account with all or almost all material based on a single aspect.

Relevance

(maximum 2 marks)

Mark	Descriptor
2	All material present is clearly relevant to the title. Allowance should be made for judicious use of introductory material.
1	Material generally selected in support of title but some of the main content of the essay is of only marginal relevance.
0	Some attempt made to relate material to the title but considerable amounts largely irrelevant.

Quality of Written Communication

(maximum 2 marks)

Mark	Descriptor
2	Material is logically presented in clear, scientific English. Technical terminology has been used effectively and accurately throughout.
1	Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate. Some minor errors.
0	The essay is generally poorly constructed and often fails to use an appropriate scientific style and terminology to express ideas.

Total marks = 20