



General Certificate of Education

Environmental Science 6441

ESC4 Biotic Resource Management

Mark Scheme

2008 examination – June series

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Environmental Science
June 2008**ESC4****Instructions: ; = 1 mark / = alternative response A = accept R = reject****Question 1**

Statement	True	False
Fishing can be made more sustainable by setting quotas below the maximum sustainable yield	✓	
The most efficient fish farms have energy ratios greater than 1		✓
Transgenics is simply a faster version of selective breeding		✓
Boycotting furniture made from tropical hardwoods may result in faster disease cures	✓	
Organic farming systems are less productive than intensive systems because no pest control is allowed		✓

Total marks = 5

Question 2

- 2 (a) High inputs/outputs/yield per unit area/time;
example of inputs/strategies:
agrochemicals/glasshouses/battery farms/polytunnels/multicropping;
diminishing returns/low ER; MAX 2
- 2 (b) (i) As cereal production increases, mean bird populations decreases/
negative correlation; 1
- 2 (b) (ii) Removal of habitat/hedgerows/trees/nesting sites;
named herbicides/pesticides killing food sources/thinning egg shells;
drainage;
biomagnification;
herbicides/fertiliser reduces plant diversity/use of monoculture;
more birds eat more crops; MAX 2
- 2 (c) Avoids artificial pesticides/herbicides;
less contamination of food/water/leaching/eutrophication/ref soil biota;
less biomagnification/bioaccumulation;
biocontrol uses natural predators;
named green/natural fertilisers/avoids named chemical fertilisers ;
reduced fossil fuel use (in manufacture)/global climate change/acid rain/E greenhouse effect;
no hormones;
no GM contamination; MAX 5

Total marks = 10

Question 3

- 3 (a) Consumption has increased/positive correlation;
decline in 1980s but beginning to increase again;
nitrates increased/decrease in phosphates/potassium;
developing countries use most; MAX 3
- 3 (b) Removed with crop/by uptake;
leaching; 2
- 3 (c) Natural gas finite/will become increasingly expensive;
named/catalysts finite/will become increasingly expensive;
air pollution/eghe/acid rain/gh gasses; MAX 2
- 3 (d) Better varieties/genetic improvement/selective breeding/HYVs;
more careful application;
better mixture of NPK/components;
improved harvesting/named processing techniques;
crop rotation;
more irrigation/controlled environments;
greater use of low solubility/slow release fertilisers;
improving soil structure/more natural/green manures;
legumes;
mulches reduce leaching; MAX 3

Total marks = 10

Question 4

- 4 (a) Landings fluctuated;
but increased;
marked increase (in early 1960s); OWTTE
followed by crash; OWTTE MAX 3
- 4 (b) Caught deeper/bigger/more fish;
fish caught before maturity/small/young fish caught;
spawning biomass declined;
replacement/slower reproduction/population couldn't recover/MSY exceeded;
habitat/seabed destruction; MAX 2
- 4 (c) Set by governments not scientists;
fishermen ignore them/exceed them/problems of policing;
scientific data may be incorrect/credit examples;
ref to by-catch; MAX 2
- 4 (d) Total biomass/stock;
spawning stock biomass/B(R)/recruitment;
age to maturity;
natural mortality/D(R);
migration; MAX 3
[R reproduction rate/number of fish/population]

Total marks = 10

Question 5

- 5 (a) (i) Loss of interception/cover/increases raindrop impact/compaction;
loss of absorption/evapotranspiration;
increased runoff/overland flow;
reduced lag time;
reduced root binding/OM;
weaker soil structure;
erosion/rills/gullies/soilwash/sheetwash;
sedimentation of rivers; MAX 4
- 5 (a) (ii) Ref interception/condensation/precipitation harvesting;
stem flow;
ref to groundwater storage;
prevents runoff/loss to oceans/increased infiltration;
regulates river regimes;
increased evaporation/transpiration;
increases inland/downwind precipitation; MAX 3
- 5 (a) (iii) Pollinators;
seed dispersal;
needed for crop growth;
ref to biological control of pests;
insects as detritivores; MAX 2
- 5 (b) 30 million tonnes 1
- 5 (c) (i) Forests maintained/afforestation/reforestation/stop deforestation;
carbon sinks/photosynthesis/reduced carbon dioxide;
reduced warming/eghe/gh gasses/global climate change;
reduced thermal expansion/sea level rise;
reduced storms
reduced erosion/flooding; MAX 3
[R ice melt]
- 5 (c) (ii) Genes for pest resistance/growth traits/medicines;
discovered/grow in forests; 2

Total marks = 15

Question 6

Quality of Written Communication is assessed in this answer.

- 6 (a) Less intensive;
reduced reliance on artificial inputs;
eg agrochemicals/fertilisers/pesticides/herbicides/hormones/FFs/antibiotics;
EU nitrates directive;
legumes;
natural/green fertilisers;
organic systems;
EU agri-environment payments for organic farms;
stewardship;
mixed farming;
outputs recycled as inputs;
crop rotation;
soil conservation techniques;
re-establish hedges/Hedgerow Incentive Scheme;
Farm Woodland Scheme;
biological control;
FWAG;
Biodiv Action Plan UK;
grow crops in season;
reduce food miles/local Farmers' markets;
farming at a lower trophic level;
ban GM;
GM crops require less agrochemicals;
- 6 (b) Domestication has been practised for thousands of years;
choose characteristics that are of benefit to humans;
docility, high yield etc;
breeding selected individuals;
huge increases in output;
in both plants and animals;
HYVs/Green Revolution;
inbreeding;
outbreeding;
GM controversial;
may increase or decrease dependence on inputs;
traits that can be engineered;
difference between breeding and GM;
selective breeding slower/more controllable than GM;
global food demands met by a narrow range of plants/animals;
less/no seasonality;

20

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	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.