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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Environmental Science 6441

ESC4 Biotic Resource Management

Mark Scheme

2008 examination – June series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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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; [**R** ice melt]	MAX 3
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.