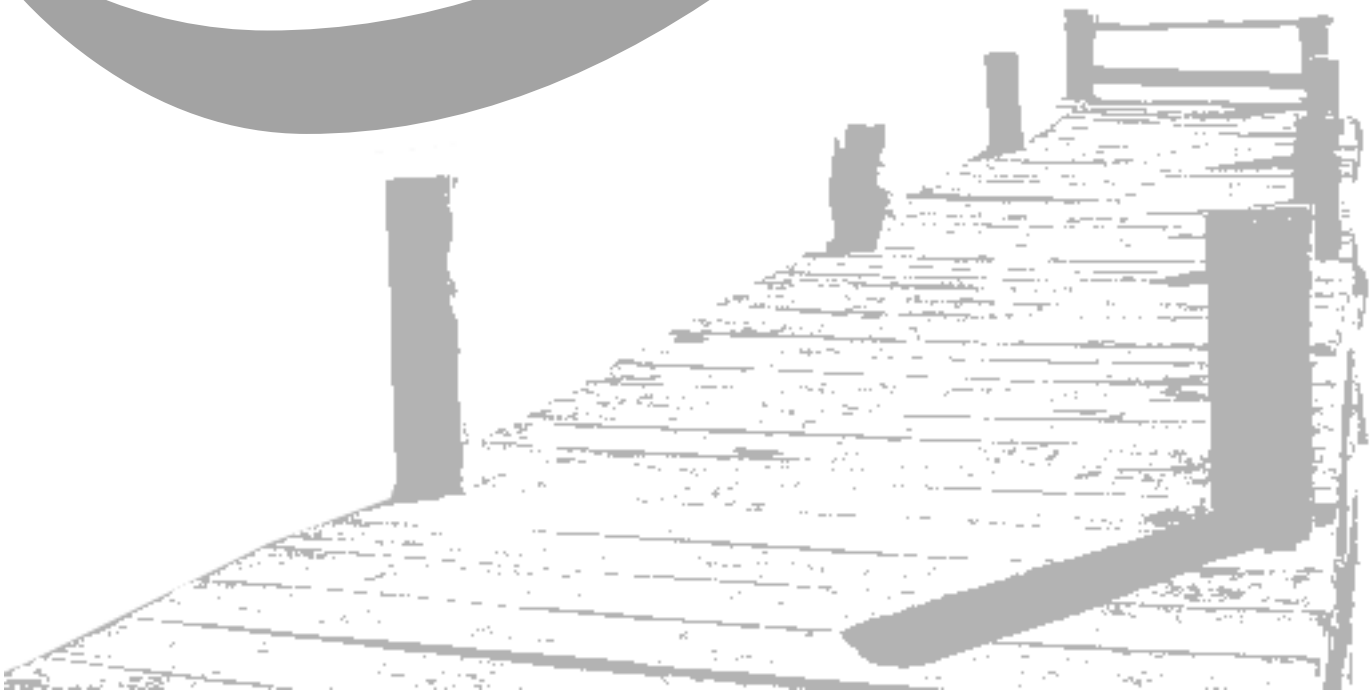
GCE
AS and A Level

Environmental Studies

AS exams 2009 onwards
A2 exams 2010 onwards

Unit 4: ENVS4
Specimen mark scheme

Version 1.1



ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Environmental Studies

Biological Resources and Sustainability ENVS4

Specimen Mark Scheme

for 2010 examination

The specimen assessment materials are provided to give centres a reasonable idea of the general shape and character of the planned question papers and mark schemes in advance of the first operational exams.

For operational papers, mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. The 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 on 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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Dr Michael Cresswell Director General

Environmental Studies

Specimen Unit
Mark Scheme **ENVS4**

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

Question 1

Term	Definition	
	Growth of a single crop over a large area	;
	Maximum allowable catch	;
	Outputs/inputs	;
	Pest control that uses a combination of biological, chemical and cultural techniques	;
	The maximum harvest that will not damage the ability of the resource to supply that harvest indefinitely	;

5

Total marks = 5

Question 2

2 (a) Single species/genetically uniform producing uniform crop;
low labour as all trees require same named procedure at same time
eg weeding/pesticides/thinning/harvesting;
close planting produces tall, straight stems/few side-branches; MAX 2

2 (b) (i) Decreased interception;
increased runoff/overland flow/increased flooding;
decreased infiltration/waterlogging;
decreased (evapo)transpiration/humidity; MAX 3

2 (b) (ii) Increased rainsplash/raindrop impact;
decreased root binding/decreased OM/increased erosion/
soil becomes dust; MAX 2

2 (c) Not viable;
costs > benefits;
ref to data from table; 3

Total marks = 10

Question 3

3 (a) Long timescale of formation; 1

3 (b) Texture
organic matter content
structure
permeability/compaction
} 2 needed for 1 mark
MAX 1

3 (c) Terracing;
contour ploughing;
tied ridges;
reduced flow rate/velocity;
reduced kinetic energy;
MAX 3

3 (d) Organic/natural fertilisers;
legumes;
nitrogen fixation;
plant roots bind soil;
foliage reduces raindrop impact;
artificial fertilisers;
no features that reduce erosion;
improves drainage/increases infiltration/reduces runoff;
aids ped formation;
MAX 5

Total marks = 10

Question 4

4 (a) Extensive – high yield per unit input/low input per unit area;
intensive – low yield per unit input/high input per unit area;
eg of input/fertiliser/pesticide/machinery/energy; 3

4 (b) Definition of sustainability/actions that meet the needs of the present without compromising future needs;
high nutritional value of meat;
not applicable to all cultures;
low energy efficiency of production;
description of food chain losses;
need for extra food inputs;
example of inputs/arable crops/cereals/oilseeds/fishmeal;
ref to shortage of agricultural land;
ref to overfishing;
eg of unsustainable feature of livestock food production;
ref to unsustainability of antibiotic use;
methane production;
habitat destruction for extra farmland;

use of poor pastures;
only usable for (cellulose digesting) herbivores; MAX 7

Total marks = 10

Question 5

5 (a) 2 aspects for each mark;;
eg
same number of fish per unit area/volume
each fish same mass
genetically closely related
same size of pond
same temperature
same mass of manure in each pond MAX 2

5 (b) (i) Chicken manure most productive, linked to phosphorous content; 1

5 (b) (ii) Less than 1 in 100 chance that the results are due to chance; 1

5 (b) (iii) BOD measures effect of pollutants not quantity/different organic pollutants have different effects; 1

5 (c) Sampling location
ref to distance from cages;
transect/justification of location;

Sample number/size
ref to repetitions;
to reduce variation;
enable statistical analysis;

Sampling method
kick sampling/surber samples/quadrat;
detail of method use;
named toxon;

Data handling
named biodiversity index/named statistical method; MAX 5

Total marks = 10

Question 6

6 (a) New foods;
crop breeding programmes;
pest biological control;
medicines;
physiological research;
beneficial inter-species relationship/pollination/seed dispersal/nutrient recycling;
economic products;
role of trees in hydrological cycle/transpiration/rainfall production; MAX 3

6 (b) (i) Overall increase with reference to values (4.4 to 14);
increase of CO_2 (6 to 13); 2
[**A** increase in cropland 0.8 to 2.6]
[**A** increase in urban area 0.1 to 0.4]

6 (b) (ii) Identify CO_2 as major issue;
up to two named carbon sequestration methods/tree planting/CO_2 storage;;
up to two methods of reducing CO_2 emissions/fuel change/conservation;;
up to two named indirect methods/education/legislation/incentives/taxes;;

cropland (as second priority);
named method to reduce footprint/fertilisers/pesticides/intensity/ mechanisation;
urban land large <u>proportional</u> change;
named transport policy/increased public transport/congestion charges;
named waste disposal strategy; MAX 5

6 (c) Credit evidence of:
links between information in graphs and development;;
link between development and footprint;;
link between development and rate of population growth;;
information from own knowledge to support this;;

living planet index is declining
link between living planet index and biodiversity
ref to where biodiversity is being lost
link between biodiversity loss and footprint

footprint is increasing
growth is in MEDCs
MEDC impact growing/LEDC not

MEDC population growth slow/LEDC rapid
sooner MEDCs develop the sooner population growth will slow
so total footprint would be lower
but still be unsustainable

link between development and footprint
ref to sustainable development
ref to stewardship/ethical link between levels of development
eg renewable energy
sustainable agriculture MAX 5

Total marks = 15

Question 7

EITHER 7 (a) Maintenance of atmosphere/climate
- photosynthesis – respiration
- $CO_2 – O_2$
- carbon sequestration/carbon reservoir
- temperature regulation – water heat store
- temperature regulation – low albedo

Hydrological cycle
- interception
- reduced runoff/infiltration
- reduced storm hydrograph peaks
- transpiration
- water transfer inland
- deforestation and desertification

Soil conservation
- role of soil in supporting other species
- rainfall erosion reduction
  - interception
  - reduced raindrop impact
  - DOM mulch
  - soil held together by roots/humus
- impact of eroded soil on river/lake/marine life

Species interdependence
- food web links
- nutrient supply
- control of abiotic factors

OR 7 (b) Chemical pesticide use
- reference to groups/examples
- organochlorines/DDT/dieldrin/aldrin
- organophosphates/parathion
- pyrethroids/permethrin
- paraquat
- others

Advantages
- rapid control
- high pest mortality
- ease of use
- low labour costs

Disadvantages
- persistence
- bioaccumulation
- biomagnification
- impact on non-target species
- reduced effectiveness with long-term/over use
- toxicity

Non-pesticide pest control
- reference to named methods
- natural predator habitats
- introduced predators/parasites/diseases
- cultural techniques/crop rotation/polyculture/barrier crops
- manual control/weeding
- genetic resistance
- sterile male techniques
- pheromone traps

Advantages – linked to specific method
- low/no impact on non-target species
- low cost of technology
- long-term protection

Disadvantages
- slow response
- effect often species-specific/won't work for some species
- predators may kill other species
- often only partially effective

credit discussion of relative merits

OR **7** (c) Descriptions of unsustainable management/exploitation with examples and more sustainable management methods

credit discussion of ease/problems of implementation

overfishing eg cod, tuna, orange ruffy, sharks
- sustainable management:
- catch quotas
- net mesh limits
- escape panels
- effort limits/boat size/engine size/time limits
- method restrictions
- no-take zones

foodweb impacts
- eg predatory fish, terns, ganets
- catch quotas/no-take zones

by-catch
- eg whales, turtles, albatross
- method restrictions/modifications
- eg drift nets/reflectors/decoys

seabed impacts
- eg trawling disturbance, coral reef damage
- protected areas

ghost fishing
- eg lobsters killed in lost pots
- radio trackers
- biodegradable gear

mineral extraction
- sand/gravel/ore dredging
- manages nodules
- EIA of site/avoid sensitive areas

waste disposal/discharges
- alternative methods
- control methods
- site assessment/analysis of current/dilution

national/international agreements
- UN Commission on the Law of the Sea
- Antarctic Treaty
- Mediterranean Action Plan
- London Dumping Convention
- EU Common Fisheries Plan
- named protected area

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.

Total marks = 20

ENVS4

Assessment grids

Specification Section	Question number							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
3.6.1						3	20	**23**
3.6.2	3	2	10	5				**18**
3.6.3	2				10			**12**
3.6.4		8						**10**
3.6.5				5		12		**17**
Total	**5**	**10**	**10**	**10**	**10**	**15**	**20**	**80**

Specification Section	Question number							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
AO1 Knowledge with understanding	5	2	1	3		3	7	**21**
AO2 Application, analysis and evaluation		5	8	7		7	13	**40**
AO3 Experiment and investigation		3	1		10	5		**19**
Total	**5**	**10**	**10**	**10**	**10**	**15**	**20**	**80**