A-LEVEL

Environmental Studies

ENVS4: Biological Resources and Sustainability
Mark scheme

2440
June 2015

Version/Stage: 1.0 Final

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' 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.

Further copies of this mark scheme are available from aqa.org.uk

Environmental Studies

June 2015 **ENVS4**

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

AO = Assessment Objective

<table>
<tr><th>Question</th><th>Answers</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td>1</td><td>
<table>
<tr><td>Bovine Somatotropin</td><td>A hormone which may be used to increase milk production in dairy cattle</td></tr>
<tr><td>Productivity;</td><td>Yield per unit area</td></tr>
<tr><td>Integrated pest control</td><td>Pest control using a range of different methods;
[R if only one method used]</td></tr>
<tr><td>Irrigation</td><td>The application of water to increase crop productivity</td></tr>
<tr><td>Embryo transfer/ surrogacy;</td><td>A technique to maximise the number of offspring obtained from high quality female livestock</td></tr>
<tr><td>Extensive agriculture</td><td>Farming type using low inputs per unit <u>area</u>/over large <u>area;</u></td></tr>
<tr><td>Green manure/named green manure crop;</td><td>A crop grown to conserve soil nutrients, rather than to produce food</td></tr>
</table>
</td><td>5</td><td>AO1+ AO3
3.4.2</td></tr>
<tr><td>Total</td><td></td><td>5</td><td></td></tr>
</table>

Question	Answers	Mark	AO / Spec. Ref.
2(a)	direct relationship/follow same trend before 2004**;** [**A** positive correlation] inverse relationship/trends diverge after 2004**;** [**A** negative correlation] [**R** if data/values quoted are incorrect]	2	AO3 3.4.4
2(b)	harvest for specified reason/product**;;** eg fuel named structural use of timber paper or fibre [**A** sale of wood/timber for one mark if no example given] named alternative land use**;;** eg agriculture mineral extraction urban development, transport infrastructure reservoirs, HEP schemes	max 3	AO2 3.4.4
2(c)	sustainable/long-term harvest**;** (eco)tourism/recreation**;** food/genetic resource/biological control species**;** medicines/cosmetics**;** biomimetics**;** debt for nature swaps**;** carbon trading payments**;** economic benefit of: climate management**;** water catchment protection**;** soil conservation/erosion control**;**	max 3	AO2 3.4.4
2(d)	sustainable/responsible use of world's forests**;** monitors/accredits (sustainable) forestry businesses/operations**;** certification/labelling of forest products**;** promotes cooperation between stakeholders**;**	max 2	AO1 3.4.4
Total		**10**	

Question	Answers	Mark	AO / Spec. Ref.
3(a)	**two** named activities and processes (that release GHG)**;;** eg ploughing increases aerobic decay drainage increases aerobic decay use of nitrogen fertiliser increases denitrification addition of organic matter increases decay deliberate flooding (eg padi fields) increases anaerobic decay compaction increases anaerobic decay	2	AO1 3.4.2
3(b)	standard deviation/spread of values about the mean/ all individual values for each mean/number of values for each mean**;**	1	AO3 3.4.2
3(c)(i)	increased input for crop growth for livestock food**;;** eg fertiliser pesticides mechanisation or transport [**A** maximum of 1 mark if input not named or no named input] named additional input for livestock rearing; eg housing heating cooling antibiotics hormones fuel use for processing or transport	max 2	AO2+ AO3 3.4.2
3(c)(ii)	reference to trophic levels/position in food chain**;** named energy loss in each trophic level**;**	2	AO2+AO3 3.4.2

3(d)	steep gradient**;** waterlogging/flood risk**;** drought/unreliable rainfall**;** short growing season**;** extreme temperatures**;** extreme winds**;** low light levels due to aspect**;** nutrient deficient**;** unsuitable soil pH**;** unsuitable salinity**;** stony/shallow soil/erosion risk**;** soil texture/moisture retention**;** [**A** infertile soil for one mark if no other soil characteristics named] [**A** animals able to use plants indigestible to humans/waste food/crop residues]	max 3	AO2 3.4.2

Total		**10**

Question	Answers	Mark	AO / Spec. Ref.
4(a)	predation**;** competition for food**;** [**A** breeding grounds] [**A** disease]	2	AO2 3.4.3
4(b)	single species shoals reduces by-catch**;** no seabed damage/disturbance**;** less energy used in hauling in nets**;**	max 2	AO2 3.4.3
4(c)	purse seining: species specific/reduces over fishing of non-target species**;** hand lining: fewer fish caught/size selective**;** target species/reduces over fishing of non-target species**;** sonar location: target species/reduce catching non-target species**;** catch quotas: limit on total caught/landed/sold**;** don't exceed MSY/leave breeding population**;** catchable size limits: smaller/younger fish not caught/larger mesh size**;** escaped fish to grow/breed**;** NTZ: area where fishing is prohibited**;** protected breeding population/larger breeding individuals**;** fishing seasons: times when fishing is prohibited**;** allows population/individuals to grow/breed**;** [**A** by-catch for non-target species]	max 6	AO2 3.4.3
Total		**10**	

Question	Answers	Mark	AO / Spec. Ref.
5(a)(i)	vegetation/roots slow water flow**;** sediments/silt trapped by buffer strip/vegetation**;** buffer strip/vegetation acts as wind break reducing erosion**;** roots bind soil/interception reduces raindrop impact/erosion**;**	max 2	AO1+ AO2 3.4.2
5(a)(ii)	(compensation/payments for) lost productive area/buffer strip produces no income**;** (compensation/payments for) labour/materials**;**	2	AO1 3.4.2
5(b)	increasing width reduces mass reaching river**;** steeper gradient increases mass reaching river**;** manipulation of values**;** eg estimate of percentage/proportional change rate of change of trend actual difference from 0 to 40/1^{o} to 5^{o}	3	AO3 3.4.2
5(c)	increased turbidity reduces light levels/photosynthesis**;** increased nutrients/decay leading to reduced DO/eutrophication**;** large TSS load reduces flow rate increasing sedimentation**;** sediments blanket stream bed affects vegetation/filter feeders/ other benthic taxa**;** sedimentation reduces flow rate/increases flood risk**;**	max 3	AO1 3.4.2
5(d)	specified range of slope angles (min 3)**;** method of collecting eroded soil/run off**;** method of measuring eroded soil**;;** standardised factors**;;;** eg soil type, textural class, organic matter content same starting moisture content length of slope soil depth, mass water application rate/volume/time compaction land use repetition for representative/reliable/significant results/statistical test**;**	max 5	AO3 3.4.6
Total		**15**	

Question	Answers	Mark	AO / Spec. Ref.
6(a)(i)	21**;**	1	AO3 3.4.6
6(a)(ii)	7.34**;**	1	AO3 3.4.6
6(a)(iii)	0.01**;**	1	AO3 3.4.6
6(a)(iv)	2.5**;**	1	AO3 3.4.6
6(b)	named method and how it works**;;;;;;** eg introduced predators eat pests encouraging indigenous predators which eat pests sterile male techniques, reduced fertile mating crop rotation prevents build-up of pests lower planting density, increased plant vigour later sowing increased plant vigour sacrificial crops attract pests barrier crops deter pests pheromone traps attract pests selective breeding, natural resistance introduction of GE/GM pest resistance named taxon related to method**;;** [**R** more than one taxon for same method]	max 6	AO2 3.4.6
Total		**10**	

Question	Answers	Mark	AO / Spec. Ref.
7(a)	moving freight/people rail road air water change to reduce damage to environment personal choice alternative transport pricing mechanisms prohibition, bans design factors, vehicles, systems fuel choice for renewability reduction in: energy use pollution CO_2, CO, NO_x, particulates, SO_2, lead materials used, extraction, processing damage noise fossil fuel used road expansion rail expansion eg HS2	20	AO1+ AO2 3.4.5
7(b)	details of: water mineral nutrients carbon dioxide temperature light levels pH wind speed soil structure, aeration	20	AO1+ AO2 3.4.2

7(c)	details of: selective breeding sexual/asexual reproduction artificial insemination embryo transfer GM beneficial characteristics pest resistance drought resistance disease resistance high yields shelf-life nutrient content appearance flavour shape problems impact on biodiversity reduced gene pool inbreeding disease risk low adaptability welfare issues	20	AO1+ AO2 3.4.2

Total		**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, 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. Spelling, punctuation and grammar are almost always correct. Technical terminology has been used effectively and accurately throughout. At least one page of material is presented.
1	Account is logical and generally presented in clear, scientific English and continuous prose. Minor errors occur in spelling, punctuation and grammar. Technical terminology has been used effectively, but may contain minor errors. At least one page of material is presented.
0	The account is generally poorly constructed and often fails to use an appropriate scientific style to express ideas. Continuous prose is not used. Spelling, punctuation and grammar contain a range of errors. Little technical terminology is used. Less than one page of material is presented.