A-LEVEL
ENVIRONMENTAL STUDIES

ENVS4: Biological Resources and Sustainability
Mark scheme

2440
June 2014

Version: 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 2014 **ENVS4**

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

AO = Assessment Objective

Question	Answers		Mark	AO / Spec. Ref.
1	No-Take Zone (NTZ)	An area where fishing is forbidden	5	AO1 3.4.3
	By-catch	**Capture of non-target species (during fishing);**		
	<u>Ghost</u> fishing;	The catching of fish and other organisms by lost or discarded fishing equipment		
	Maximum Sustainable Yield (MSY)	The maximum harvest which will not reduce the ability of the population to replace losses		
	Recruitment	**The addition of new/young fish to the (adult) population;**		
	<u>Upwell</u>ing (zone);	A marine area where productivity is increased by nutrients carried up from deeper water		
	Fishing quota	**A limit on the mass/number/amount of fish which can be landed; [A caught] [R volume]**		
Total			**5**	

Question	Answers	Mark	AO / Spec. Ref.
2(a)	efficiency = yield/output per unit input**;** productivity = yield/output per unit area/specific unit of area**;** [**A** reference to percentage calculations]	2	AO1 3.4.2
2(b)(i)	intensive less efficient**;** inputs rise faster than yield/named increased input**;** eg fossil fuel use/energy subsidy manufacture of fertiliser/pesticides mechanisation/named energy use	2	AO2 3.4.2
2(b)(ii)	livestock at higher trophic level/longer food chain**;** livestock have losses due to respiration/undigested food/manure/ heat/movement/inedible parts/extra named non-food inputs**;**	2	AO2 3.4.2
2(b)(iii)	steep gradient**;** waterlogging/flood risk**;** infertile/nutrient deficient/stony soil**;** unsuitable soil pH**;** unsuitable salinity**;** shallow soil**;** drought/unreliable rainfall**;** short growing season**;** extreme temperatures**;** [**A** animals able to use plants indigestible to humans/waste food/ crop residues]	Max 2	AO2 3.4.2
2(c)	3264 × 0.45 × 3 **or** 4406.4**;** 0.162/correct calculation using incorrect answer to mp1**;** [**A** 0.16, 0.2 or expressed as a percentage] award both marks for correct final answer with no working	2	AO2 3.4.3
Total		**10**	

Question	Answers	Mark	AO / Spec. Ref.
3(a)(i)	reform/changes to government/EU agricultural policy/CAP**;** reduction of production subsidies/quotas/ response to over-production**;** low/loss of previous income/new source of income**;** new subsidies/payments**;** spread risk**;** named risk factor**;** eg disease, named climatic factor, fluctuating markets	Max 2	AO1 3.4.2
3(a)(ii)	reduced pesticide use/non-pesticide pest control/ named pest control method**;** reduced use of artificial fertilisers**;** more pollinating insects**;** organic production**;** crop rotation**;** conservation crop**;** eg for bird food, nectar, pollen, wild flowers renewable energy/specified benefit of biofuels**;** local markets/on farm processing reduces food miles/transport**;** reduce soil erosion due to increased cover/low tillage**;** mixed farming allows use of waste**;** multi-cropping/intercropping/agroforestry**;** named wildlife habitat created**;** livestock choice to reduce methane**;** conservation of rare breeds/varieties**;**	Max 3	AO1 3.4.5

Question	Answers	Mark	AO / Spec. Ref.
3(b)	increased income of LEDC/large farms/companies**;** example of exported product**;** eg cash crops, biofuel, luxury products large foreign companies/international markets control price/ price uncertainty**;** reference to tariff/price mechanisms/subsidies/ World Trade Organisation (WTO)**;** money used to increase food production/named food production method**;** decreased income of small farmers/increased rent/job losses**;** named expensive inputs**;** eg seeds, antibiotics, vets, fertilisers Fairtrade may increase incomes in LEDC/ensure fair price**;** reduced local food supplies/food choices/variety**;** traditional breeds/crop varieties/knowledge lost/replaced**;** population displacement**;** increase in cultivated area causes habitat loss/deforestation**;** named environmental impact from intensification**;;** eg salinisation, eutrophication, non-target toxicity, <u>reduced</u> biodiversity, desertification, soil erosion named pollutant from/impact of increased food miles/transport**;** named impact**;**	Max 5	AO1 3.4.2
Total		**10**	

Question	Answers	Mark	AO / Spec. Ref.
4(a)	steep slopes increase runoff rates**;** high temperatures (dries soil) increase wind erosion**;** dry weather increases wind erosion**;** intense rainfall increases rain splash erosion**;** intense rainfall exceeds infiltration capacity/increases runoff**;** dry/irregular rain reduces vegetation which reduces interception**;** dry/irregular rain reduces vegetation which reduces root binding**;** dry/irregular rain reduces vegetation which reduces soil organic matter**;**	Max 2	AO2 3.4.2
4(b)	reduced cultivation leads to increased vegetation cover/ secondary succession**;** increased interception/plant uptake/(evapo)transpiration**;**	2	AO2 3.4.2
4(c)	deposition of (eroded) sediment in HEP/tidal reservoirs**;** reduced growth of energy crops/named energy crop**;** turbid water/sediment damages turbines**;** more rapid runoff causes greater fluctuations in water availability**;**	Max 1	AO2 3.4.2
4(d)	increased demand for food/fuel/building materials**;** increased use of marginal land**;** vegetation loss/deforestation reduces soil stability/root binding/ wind protection/interception**;** ploughing/cultivation may loosen/compact soil**;** overgrazing increases runoff/reduces interception and/or infiltration**;** trampling causes poaching/soil compaction/loosens soil**;** use of manure as fuel reduces organic matter/nutrients/binding**;** reduced organic matter content damages soil structure/cohesion/ reduces infiltration**;** increased runoff from urban areas/roads**;**	Max 5	AO2 3.4.2
Total		**10**	

Question	Answers	Mark	AO / Spec. Ref.
5(a)(i)	reason for increase in phosphate concentration**;;** eg disturbance of sediment decomposition of OM excretion reason for lower oxygen content**;;** eg (respiration by) larger total biomass/number of fish in pond increased decomposition/respiration by microorganisms less photosynthesis reason for reduced light levels**;;** eg increased plankton/algal bloom disturbed sediment	Max 3	AO2 3.4.3
5(a)(ii)	**Presence of carp (systems B and C compared to system A):** polyculture/presence of carp increases yield/ any correct comparative statement of changed yields**;** sediment disturbed**;** provides food/nutrients for plankton**;** increased decomposition of organic matter (increases available nutrients for plankton)**;** carp eat zooplankton so more phytoplankton (for Rohu)**;** increased food supply for Rohu**;** **If too many carp present (system C compared to system B):** increased competition for food/zooplankton**;** high turbidity/less light for (phyto)plankton/photosynthesis**;** less food for Rohu**;** more biomass/fish results in reduced oxygen <u>for respiration</u>**;** increased disturbance, increased decomposition, reduced oxygen**;**	Max 5	AO2 3.4.3

Question	Answers	Mark	AO / Spec. Ref.
5(b)(i)	increased yield/income/food**;** reduced named problem linked to pesticide use**;** eg reduced harm to non-target organisms bioaccumulation biomagnification reduced named problem linked to fertilisers**;** eg use of energy in manufacture risk of eutrophication blue baby syndrome nitrous oxide release *Desmodium*/leguminous plants promote nitrogen fixation/ ammonium/nitrate**;** increased ground cover/OM/reduces risk of soil erosion**;** Napier grass is food for livestock**;**	Max 5	AO2 3.4.3
5(b)(ii)	selective breeding**;** species hybrids**;** GM/genetic engineering/transgenics**;** cause mutations using radiation**;** gene/allele (causes production of chemical)**;**	Max 2	AO1 3.4.2
Total		**15**	

Question	Answers	Mark	AO / Spec. Ref.
6(a)(i)	greater number of moth species in broad-leaved woodland (than in plantation)**;** [**A** non-directional or null hypothesis]	1	AO3 3.4.6
6(a)(ii)	**Measures to ensure validity;;;** traps operated at same time as each other timing to allow for seasonal changes all traps of same design/brightness/wavelength systematic sampling/all traps operated at same height from ground/ distance apart/other valid location factor eg distance from edge of woodland all students trained to same level of skill in identification/all moths identified by same person(s) [**A** identification sheet/guidebook] **Appropriate linked justification of measures;;** to eliminate differences in effects of specified variable factor eg weather, day length, moonlight, flight times of different species different species identified in different seasons to avoid differences in effectiveness/attractiveness of traps to allow for differences in moth behaviour to reduce effect of inaccurate identification	Max 4	AO3 3.4.6
6(a)(iii)	distinguish between/identify each species**;** require numbers of each species**;**	Max 1	AO3 3.4.6
6(b)	(this investigation involves finding if there is a difference between) two averages/means **and** the data are counted (rather than measured)**;**	1	AO3 3.4.6
6(c)(i)	23**;**	1	AO3 3.4.6

Question	Answers	Mark	AO / Spec. Ref.
6(c)(ii)	no significant difference in number of moth species in the two areas (at $p \leq 0.05$/5% probability that the differences are not by chance/95% probability that the differences are due to chance)**;** [**A** accept null hypothesis] (smaller) calculated value of U is greater than critical value**;** [**A** correct conclusion from wrong answer in 6ci]	2	AO3 3.4.6
Total		**10**	

Question	Answers	Mark	AO / Spec. Ref.
7(a)	**Transport** walking / cycling public transport vehicle choice driving style reduced unnecessary journeys carbon offsetting saving of named resources reduced emissions of named pollutant **Food** reduced meat consumption greater food-chain efficiency reduced emissions of named pollutant eg organic matter, methane, nitrous oxide organic food reduced pesticide use benefits wildlife reduced fertiliser use reduces named pollution problem local/in season food reduces food miles/energy used in storage **Domestic energy** installation of named insulation method installation of named renewable energy technology domestic energy-saving strategies reduced fossil fuel use reduced pollution related problems **Water** reduced personal consumption strategies water-saving technologies (eg reduced flow taps, hippos) rainwater harvesting grey water recycling reduced need for water treatment **Other resource use** refuse, re-use, recycle reduction of waste to landfill and consequent impacts ethical consumption/Fair trade less demand for raw materials less habitat destruction	20	AO1+ AO2 3.4.5

Question	Answers	Mark	AO / Spec. Ref.
7(b)	**Organic matter** manure/slurry deoxygenation of water bodies **Chemical fertilisers** eutrophication blue baby syndrome increased nitrous oxide emissions **Pesticides** harm to non-target organisms impacts on food chains and other species interactions bioaccumulation and biomagnification **Livestock** emissions of methane, ammonia, nitrous oxide consequences of increased greenhouse gases consequences of increased deposition of soluble nitrogen compounds **Energy use** pollutants from fossil fuel for machinery/agrochemicals/ food processing/storage/transport **Burning of trees after land clearance to grow crops** increased carbon dioxide **Genetic issues** GM crops	20	AO1+ AO2 3.4.2

Question	Answers	Mark	AO / Spec. Ref.
7(c)	**Resources** timber fuel food fibre medicines **Life-support services** atmospheric regulation habitat regulation of water cycle forests as carbon stores and carbon sinks climatic regulation soil conservation shelter and microclimate recreation and amenity uses	20	AO1+ AO2 3.4.4
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.

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