

GCSE

ENVIRONMENTAL SCIENCE

44401F

Mark scheme

4440

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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

Mark Scheme

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded
- the Assessment Objectives and specification content that each question is intended to cover.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

- 2.1** In a list of acceptable answers where more than one mark is available ‘any **two** from’ is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.
- 2.2** A bold **and** is used to indicate that both parts of the answer are required to award the mark.
- 2.3** Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.
- 2.4** Any wording that is underlined is essential for the marking point to be awarded.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that ‘right + wrong = wrong’.

Each error / contradiction negates each correct response. So, if the number of errors / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	green, 5	0
2	red*, 5	1
3	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a candidate writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column or by each stage of a longer calculation.

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward is kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(.....) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Ignore / Insufficient / Do not allow

Ignore or insufficient is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

4. Quality of Written Communication and levels marking

In Question 4 candidates are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Candidates will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

Level 1: basic

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

Level 2: clear

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

Level 3: detailed

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

Question	Answers	Extra information	Mark	AO/Spec
1(a)(i)	i) B ii) A iii) D iii) C	4 correct 3 marks 2/3 correct 2 marks 1 correct 1 mark	3	AO1 A2.4
1(a)(ii)	solar / A or wind / C	allow geothermal / B	1	AO2 A2.4
1(a)(iii)	equipment description linked use	allow 1 mark for appropriate end use eg solar panels for water heating or space heating solar cells for electricity generation wind generator - charging low voltage battery system, supplementing mains electricity for geothermal heating: using pipes / heat pump to heat water for the home	1 1	AO2 A2.4
1(b)(i)	USA fuel consumption is greater than the EU more rapid decline in the USA after 2010	allow 1 mark for comparison using figures without explanation	1 1	AO3 A2.2
1(b)(ii)	any three from: <ul style="list-style-type: none"> • improved aerodynamics • lower weight • more efficient engines • improved tyre technology • computer control of engine • stop /start electronics • hybrid / electric cars • improved fuels 	ignore energy efficient cars	3	AO2 A2.2

Question 1 continues on the next page...

Question 1 continued...

Question	Answers	Extra information	Mark	AO/Spec
1(b)(iii)	any three from: <ul style="list-style-type: none"> • air pollution • noise (pollution) • road construction • extraction / processing of materials • disposal of “end of life” cars • factories • wildlife killed by cars (roadkill) 	allow specific examples of air pollution. eg CO ₂ - greenhouse effect, SO ₂ - acid rain, particulates - dirty buildings	3	AO1 A2.3
1(b)(iv)	any two from: <ul style="list-style-type: none"> • hydrogen • LPG • methane • biofuels or examples 		2	AO1 A2.4
Total			16	

Question	Answers	Extra information	Mark	AO/Spec
2(a)	4 2 1 3	1 correct 1 mark 2 correct 2 marks 3/4 correct 3 marks	3	AO1 A3.1
2(b)			4	AO1 A3.1
2(c)	any three from: <ul style="list-style-type: none"> • breeding out of season • migrating at different times • loss of food sources • loss of habitat • too hot for certain species • shortage of water • flooding of wetlands • increased parasite / disease 		3	AO2 A3.3
2(d)	C - planting trees to absorb carbon dioxide		1	AO1 A3.1
2(e)	B - granite		1	AO1 A3.4
Total			12	

Question	Answers	Extra information	Mark	AO/Spec
3(a)	B C A		3	AO2 B1.2
3(b)(i)	73%		1	AO3 B1.2
3(b)(ii)	clover		1	AO3 B1.2
3(c)	any four from: <ul style="list-style-type: none"> • system for identifying area to be surveyed • system for random placing • repetition • system to count / measure species • method to identify species • data analysis 		4	AO1 B1.2
3(d)	any one from: <ul style="list-style-type: none"> • prevent them becoming extinct • to help repopulate species 		1	AO1 B1.2
3(e)	Natural England		1	AO1 B1.2
3(f)	wetlands		1	AO1 B1.2

Question 3 continues on the next page . . .

Question 3 continued . . .

Question	Answers	Extra information	Mark	AO/Spec
3(g)	any four from: <ul style="list-style-type: none"> • removal of competition • predator control • managing succession • controlling hunting etc • creating new habitats • protecting existing habitats • excluding people • provision of nest boxes • providing food for wildlife • monitor / control of disease • breeding programmes • removing objects that might harm wildlife 		4	AO1 B1.2
3(h)	any two from: <ul style="list-style-type: none"> • less vulnerable to environmental damage • greater genetic variability • increased opportunity to breed • species may be forced to leave small reserves for food causing damage or being harmed • suitable for species with large territories 	ignore “easier to manage”	2	AO2 B1.2
3(i)	endangered		1	AO1 B1.2
Total			19	

Question	Answers	Extra information	Mark	AO/Spec
4(a)	C		1	AO2 A1.1
4(b)	any three from : food supply educational needs hospital provision transport water / sewage tax revenue / economy social security needs home building energy supply	accept 2 examples with an extended explanation for 3 marks	3	AO1 A1.1
4(c)	any three from : <ul style="list-style-type: none"> • contraception • improved child survival rates • legislation eg 1 child policy • financial control • education • changing roles of women • financial- incentives to produce smaller families • (forced) migration or reduce immigration 		3	AO1 A1.1
4(d)	water shelter		1 1	AO1 A1.2
4(e)	C		1	AO1 A1.2
4(f)	pollution loss of (non-renewable) resources consumption of (non-renewable) energy production of waste loss of habitat	any three , but a different appropriate way for each (allow electricity)	3	AO2 A1.2

Question 4 continues on the next page . . .

Question 4 continued . . .

Question	Answers	Extra information	Mark	AO/Spec
4(g)	any two from: <ul style="list-style-type: none"> • less raw material consumed • less energy consumed • less land needed for waste disposal 		2	AO2 A1.2
4(h)	any one from: <ul style="list-style-type: none"> • energy used in transport / processing • water in cleaning • materials used in processing 	accept process used in recycling	1	AO2 A1.2
Total			16	

Question	Answers	Extra information	Mark	AO/Spec
5(a)	Aquifer - C Reservoir - B River - A	3 correct 2 marks 1/2 correct 1 mark	2	AO2 A2.2
5(b)	screening clarification filtration disinfection		1 1 1 1	AO1 A2.2
5(c)	any three from: <ul style="list-style-type: none"> • any water sports • leisure activities eg walking, picnicking, cycling • bird watching • fishing • HEP • flood control • to feed canals • irrigation • education 		3	AO1 A2.2
5(d)	any two from: <ul style="list-style-type: none"> • people pay for what they use • makes them use less • makes them more aware of water use 		2	AO2 A2.2
5(e)	any two from: <ul style="list-style-type: none"> • watering the garden • washing the car • flushing toilets 	the use must not require potable water	2	AO1 A2.2
Total			13	

Question	Answers	Extra information	Mark	AO/Spec
6(a)	secondary schools produce a greater percentage of paper / card and / or plastic than primary primary schools produce a greater percentage of food and / or garden waste than secondary	allow more for greater percentage	1 1	AO3 A1.2
6(b)	72 749 tonnes		1	AO3 A1.2
6(c)(i)	84 016 tonnes	correct working eg $186\,703 \times 45 / 100$ gains 1 mark	2	AO3 A1.2
6(c)(ii)	composted for the school gardens	allow provide separate bins for food and garden waste	1	AO2 A1.2
6(d)	burnt to produce heat fermented to produce methane	accept make biofuels	1	AO1 A1.2
6(e)(i)	any two from: <ul style="list-style-type: none"> • directories and catalogues • corrugated cardboard • food and beverage cans • aerosols 		2	AO3 A1.2
6(e)(ii)	directories and catalogues and corrugated cardboard – Primary schools reuse these as materials rather than recycling them food and beverage cans – primary school children are not allowed to bring cans to school aerosols – primary school children do not use aerosols	any reasonable suggestion	1	AO3 A1.2
Total			10	

Question	Answers	Extra information	Mark	AO/Spec
7(a)(i)	(allows the consumer to choose cars which –) use less fuel produce less CO ₂	accept uses less energy accept produces less pollution	1 1	AO2 A2.2
7(a)(ii)	makes it more likely that people will choose less polluting cars because of the financial incentive		1	AO2 A2.2
7(b)	any two from: <ul style="list-style-type: none"> • faster driving uses more fuel • more stopping and starting uses more fuel • more time spent standing in traffic all increase consumption • smoother driving reduces consumption • short journeys have high fuel consumption 		2	AO2 A2.2
7(c)	either use same volume of fuel measure the distance or use the same distance measure fuel consumed any two control measures: eg same driving conditions same measuring equipment same driver same type of fuel same amount of fuel at start	allow use same amount of fuel ignore repeats	1 1 2	AO2 A2.2
Total			9	

Question	Answers	Extra information	Mark	AO/Spec
8(a)	D C A B	all four correct two marks two correct for one mark	2	AO1 A1.4
8(b)	lime		1	AO1 A1.4
8(c)	rain water leaches / dissolves nutrients nutrients get into groundwater groundwater fills aquifer	accept dissolved nutrients run off into streams and rivers	1 1 1	AO2 B2.2
Total			6	

Question	Answers	Extra information	Mark	AO/Spec
<p>9(a)</p>	<p>any three from:</p> <ul style="list-style-type: none"> • increase in species that cod feed on eg herring / zooplankton • increase in species that eat herring / zooplankton • decrease in species that feed on cod eg shark / seal • decrease in species that predators of the cod feed on • impact on humans described, eg loss of income for fishermen 	<p>ignore decrease in numbers of humans</p>	<p>3</p>	<p>AO2 B1.1</p>
<p>9(b)</p>	<p>any three from:</p> <ul style="list-style-type: none"> • allow to breed • they need to reach maturity / breed before they are caught • need to protect all the species they feed on throughout their life cycle • need to protect the areas where they breed / live (because they do not migrate) • rear cod in fish farms 	<p>allow avoiding fishing at the time when the fish are breeding</p>	<p>3</p>	<p>AO2 B1.3</p>
<p>9(c)</p>	<p>numbers of a particular species you are allowed to catch</p>		<p>1</p>	<p>AO1 B1.3</p>

Question 9 continues on the next page . . .

Question 9 continued . . .

Question	Answers	Extra information	Mark	AO/Spec
9(d)	any three from: <ul style="list-style-type: none"> • line fishing • increased net mesh size • further legal protection • over-quota not thrown back • avoiding nets that damage habitats • avoid fishing in breeding grounds or over-fished areas 	eg size of ship, hours allowed to fish ignore quota unqualified ignore activities that are not part of cod fishing eg fish farming, eating alternative fish, reintroduction of fish stocks	3	AO1 B1.3
Total			10	

Question	Answers	Extra information	Mark	AO/Spec
10(a)	any three from: <ul style="list-style-type: none"> • pollution • desertification • salinization • global warming • erosion • flooding • building / urbanisation • other specified alternative uses for land • growing non-food crops 	ignore "cash crop" allow soil damaged by farming methods eg reservoirs, solar arrays, landfill	3	AO2 A1.3
10(b)	a crop with genes not present in its parents		1	AO1 A1.3
10(c)	where genes are transferred from one <u>species</u> to another	allow characteristics are transferred from one <u>species</u> to another	1	AO1 A1.3

Question 10 continues on the next page . . .

Question 10 continued . . .

Question	Answers	Extra information	Mark	AO/Spec
10(d)	QWC see below		4	AO1 A1.3
	Marks awarded for this answer will be determined by the quality of written communication.			
	The answer is coherent and in a logical sequence. It contains a range of appropriate relevant specialist terms used accurately. The answer shows very few errors in spelling, punctuation and grammar. There is a clear and detailed scientific explanation of how changes in agricultural methods increased crop yields.		4	
	The answer has some structure and the use of specialist terms has been attempted, but not always accurately. There may be some errors in spelling, punctuation and grammar. There is a description of how changes in agricultural methods increased crop yields but there is limited explanation and a lack of clarity and detail.		2–3	
	The answer is poorly constructed with an absence of specialist terms or their use demonstrates a lack of understanding of their meaning. The spelling punctuation and grammar are weak. There is some description of how changes in agricultural methods increased crop yields.		1	
	No relevant content.		0	
	Answers explain a range of different examples including: use of fertilisers use of pesticides use of machinery environmental control plant breeding irrigation protected cultivation		4	
Total			9	