ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Environmental Science

Unit 1 Topics in Environmental Science

44401H

Specimen Mark Scheme

For exams June 2011 onwards

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. 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.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

Set and published by the Assessment and Qualifications Alliance.

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Marking Guidance for Examiners
GCSE Science Papers

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 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.

OWTTE can be used as an abbreviation for 'or words to that effect'

2 Crediting quality of overall response

In questions where there are a number of acceptable responses, the whole answer needs to be considered to ensure that marks that have already been awarded are not contradicted.

3 Emboldening

3.1 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 lines is a potential mark.

3.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

3.3 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.)

4 Marking points

4.1 Marking of Quality of Written Communication (QWC)

In some questions candidates are assessed on using good English, organising information clearly and using specialist terms where appropriate.

Instructions for assessing QWC are given against the appropriate questions in the mark scheme.

4.2 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 error/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: Name the part of the cell that carries genetic information from parent to offspring (1 mark)

Candidate	Response	Marks awarded
1	chromosome, gamete	0
2	chromosome, cytoplasm	0
3	chromosome, *nucleus	1
4	nucleus*, cytoplasm	0

Example 2: Name the two products of aerobic respiration. (2 marks)

Candidate	Response	Marks awarded
1	Oxygen, carbon dioxide, water	1
2	Oxygen, carbon dioxide, water, nitrogen	0

4.3 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.

4.4 Marking procedure for calculations

Full marks can be given for a correct numerical answer, as shown in the column 'answers', 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;

4.5 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.

4.6 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 are 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.

4.7 Phonetic spelling

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

4.8 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.

Higher Tier – 44401H

Question 1 44401H Question 11 44401F

	answers	extra information	mark
a(i)	decreases		1
a(ii)	% ground covered by shrub layer		1
a(iii)	number of blue tits / pied flycatchers		1
a(iv)	any **one** from:- tree / shrub layer species because species may have different preferences time of day / year because species may be active / present at different times use / disturbance in woods because species may respond differently	one mark for simple statement second for linked explanatory statement	1 1
a(v)	92		1
b(i)	excluding sheep will allow shrub growth which encourages flycatchers / because of natural succession	one mark for simple statement second for linked explanatory statement	1 1
b(ii)	excluding sheep would allow growth of shrubs, etc. / natural succession therefore causing reduction in the rare plant	one mark for simple statement second for linked explanatory statement	1 1

c	**Facilities** nature trails / interpretative facilities / hides / wildlife feeding stations / nest boxes	accept any valid facility not included in question	1
	reasons include educating public / allowing close observation of wildlife / increasing wildlife populations	together with relevant reason	1
Total			**12**

Question 2 44401H Question 12 44401F

	answers	extra information	mark
a(i)	No Yes	both correct for 1 mark	1
a(ii)	any **two** from noise visual impact risk to wildlife disturbance to TV signals deters tourists		2
a(iii)	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 or 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 the benefits of obtaining energy from wind power rather than fossil fuels.		**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 scientific explanation of the benefits of obtaining energy from wind power rather than fossil fuels, but there is 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 a brief explanation of the benefits of obtaining energy from wind power rather than fossil fuels, which has little clarity and detail.		**1**
	No relevant content.		**0**
	Examples of scientific points that may contribute to a candidate's response: • does not emit carbon dioxide therefore does not add to Greenhouse Effect • does not emit sulfur dioxide/ oxides of nitrogen therefore does not add to acid deposition • does not burn fossil fuels therefore does not cause air pollution		

b(i)	development which meets present needs without compromising the ability of future generations to achieve their needs and aspirations OWTTE	mention of future essential for second mark	1 1
b(ii)	any **one** from:- will control floods allowing safer use of river valley in future will generate as much electricity as 10 coal fired power stations therefore reducing air pollution / conserving resources	one mark for simple statement second mark for linked explanatory statement	1 1
b(iii)	any **one** from people have to move therefore can't enjoy homes in future Yangtze River Dolphin / historic sites / unpolluted water harmed affects enjoyment of future generations	one mark for simple statement second for linked explanatory statement needs at least implicit mention of future harm / deprivation for second mark.	1 1
Total			**13**

Question 3 44401H Question 13 44401F

	answers	extra information	mark
a(i)	**Action:** any **one** from: pondweed same size / species same volume / concentration of solution same light intensity same time of day **Reason:** because stated factor likely to affect rate of photosynthesis OWTTE		1 1
a(ii)	bubble count checked by second observer	accept replicates	1
a(iii)	any **three** from:- initial rise followed by fall fall steeper credit accurate reference to values	See section 2 of the Marking Guidelines	3

b(i)	need to maintain optimum temperature	See section 2 of the Marking Guidelines	1
	if too cold vents closed		1
	if too hot vents opened		1
b(ii)	raises temperature		1
	provides extra carbon dioxide		1
b(iii)	housed livestock / poultry or specific eg of this		1
Total			**12**

Question 4 44401H

	answers	extra information	mark
a(i)	short		1
	sun		1
	long		1
	absorbed		1
a(ii)	maintains sufficiently high temperature		1
b(i)	sea level rise	one mark for simple statement	1
	may cause flooding / loss of land		1
	increased storminess	second for linked explanatory statement	1
	may cause damage / limit access		1
b(ii)	the total amount of carbon dioxide, and other greenhouse gases, emitted over the full life cycle of a product, service or event OWTTE		1
b(iii)	MEDCs use more energy / burn more fossil fuels		1
	therefore responsible for more carbon dioxide emissions		1
Total			**12**

Question 5 44401H

	answers	extra information	mark
a(i)	screening removes large objects		1 1
a(ii)	(most) (organic matter) particles separated / removed by settling to bottom		1 1
a(iii)	(liquid) effluent is treated biologically / acted on by organisms in the presence of oxygen / to remove organic matter / reduce BOD		1 1
a(iv)	sewage sludge is treated biologically / acted on by organisms in the absence of oxygen / to remove most pathogens / releasing methane		1 1
b(i)	untreated sewage contains pathogens / micro-organisms / bacteria / viruses which may cause disease / illness		1 1
b(ii)	any **one** from:- harms / kills some aquatic organisms because of deoxygenation may increase populations of some organisms by providing extra food supply	one mark for simple statement second for linked explanatory statement	1 1
Total			**12**

Question 6 44401H

	answers	extra information	mark
a(i)	chemicals used to kill organisms which damage crops / reduce yields	chemicals which kill pests = 1 mark only	1 1
a(ii)	organism produced by artificial combination of genes in a way which would not occur through natural fertilisation / by transfer of genes from another species	one mark for simple statement second for linked explanatory statement	1 1
b(i)	any **one** from:- kills pest reduced need for spraying therefore reduced costs / saves time	one mark for simple statement second for linked explanatory statement	1 1
b(ii)	reduced frequency of spraying / Bt targets pest only therefore fewer organisms killed	one mark for simple statement second for linked explanatory statement	1 1
c	may spread by pollination to other plants therefore harming non – target insects / creating ‘superweeds’ some people simply believe GM is wrong / unethical because it usurps role of God	one mark for simple statement second for linked explanatory statement	1 1 1 1
Total			**12**

Question 7 44401H

	answers	extra information	mark
a(i)	5.6% evidence of $\frac{590 - 557}{557} \times 100$ for 1 mark	correct answer earns 2 marks	2
a(ii)	any **two** from decrease in total emissions since 1990 decrease in emissions from energy supply (largest emitter) decrease in emissions from business emissions from transport stabilising		2
a(iii)	any **two** from total emissions only decreased by only 5.6% so far decrease in total emissions not sustained emissions from energy generation rising since 2005 increased emissions from transport since 1990		2

b(i)	any **four** from decrease in emissions from agriculture large decrease from industrial processes increase from road transport MAX 2 marks for appropriate references to values.	See section 2 of the Marking Guidelines	4
b(ii)	fertilisers contain nitrates which are broken down by (denitrifying) bacteria (as part of the nitrogen cycle		1 1
Total			**12**

Question 8 44401H

	answers	extra information	mark
a(i)	fission		1
a(ii)	any **one** from plutonium uranium		1
a(iii)	heat boils water to steam steam turns a turbine turbine turns a generator		1 1 1
b(i)	does not emit carbon dioxide therefore does not add to the Greenhouse Effect	one mark for simple statement second for linked explanatory statement	1 1

b(ii)	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 or 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 the disadvantages of building new nuclear power stations.	**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 scientific explanation of the disadvantages of building new nuclear power stations, but there is 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 a brief explanation of the disadvantages of building new nuclear power stations, which has little clarity and detail.	**1**
	No relevant content.	**0**
	Examples of valid points that may contribute to a candidate's response: • moral/ethical objections because of link with nuclear weapons • risk of accidents which cause release of radioactive material /radiation / eg Chernobyl or Windscale • risk of exposure to radiation causing damage to health/cancer • production of waste which will remain dangerous/ radioactive for many years	
Total		**11**

Question 9 44401H

	answers	extra information	mark
a(i)	1970 (accept 1969 – 71) stocks fall from this time onward and never fully recover their numbers OWTTE	one mark for simple statement second for linked explanatory statement	1 1
a(ii)	any **two** from decreasing catches decreasing age of fish decreasing size of fish		2
a(iii)	any **two** from larger / more powerful boats allow easier access to distant waters / allow larger nets to be used factory ship system allows fishing boats to stay on fishing grounds longer sonar allows easier location of shoals of fish synthetic fibres (eg nylon) allow larger / lighter / less visible nets / lines	one mark for simple statement second for linked explanatory statement MAX 2 for simple list	1 1 1 1

b	any **two** from replenishing fish stocks by reintroductions fish farming to reduce pressure on wild stocks line / mesh size / shape restrictions to make fishing less effective / reduce by-catch / allow some fish to escape to breed reducing fishing effort / intensity by zoning / fishery closures / close seasons / fleet reduction marketing of alternative fish / eco-labelling to reduce pressure on particular species / encourage less intensive fishing methods international agreements e.g. EU Common fisheries Policy or Convention for the Conservation of Antarctic Marine Living Resources	one mark for simple statement second for linked explanatory statement MAX 2 for simple list	1 1 1 1
Total			**12**

Question 10 44401H

	answers	extra information	mark
a(i)	algae will die and decompose	accept floating algae cut off light	1
	leading to deoxygenation of water	reducing photosynthesis and causing deoxygenation	1
		accept also night-time algal respiration may cause deoxygenation.	
a(ii)	leaching / runoff of fertilisers	accept slurry, silage effluent or eroded soil as sources of nutrient enrichment	
	lead to eutrophication / nutrient enrichment	one mark for simple statement	1
		second for linked explanatory statement	1
a(iii)	any **one** from		
	Risk	1 mark for risk	
	drowning		1
	being swept away		
	contact with pathogens		1
	Risk reduction	second for appropriate safety measure	
	safety lines		
	buoyancy aids		
	protective clothing / hygiene		

b	MAX 5 of following **method points** use of net kick sampling shallow water place samples in white container identify organisms compare organisms found with descriptions of pollution levels / calculate biotic index credit one mention of pollution intolerant organism e.g. mayfly/stonefly nymph credit one mention of pollution tolerant species e.g. rat-tailed maggot / bloodworm MAX 2 of following **fair test points** sampling from same depth / distance from bank same type of location eg all riffles, not mix of pool and riffle replicate samples standardised collection technique same time of day / year	See section 2 of the Marking Guidelines	MAX 6
Total			**12**