



# GCSE

## Science A

General Certificate of Secondary Education

Unit **A212/02**: Unit 2: Modules B2, C2, P2 (Higher Tier)

## Mark Scheme for January 2011

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by Examiners. It does not indicate the details of the discussions which took place at an Examiners' meeting before marking commenced.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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Any enquiries about publications should be addressed to:

OCR Publications  
PO Box 5050  
Annesley  
NOTTINGHAM  
NG15 0DL

Telephone: 0870 770 6622  
Facsimile: 01223 552610  
E-mail: [publications@ocr.org.uk](mailto:publications@ocr.org.uk)

## Guidance for Examiners

Additional Guidance within any mark scheme takes precedence over the following guidance.

1. Mark strictly to the mark scheme.
2. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
3. Accept any clear, unambiguous response which is correct, eg mis-spellings if phonetically correct (but check additional guidance).
4. Abbreviations, annotations and conventions used in the detailed mark scheme:

/	= alternative and acceptable answers for the same marking point
(1)	= separates marking points
<b>not/reject</b>	= answers which are not worthy of credit
<b>ignore</b>	= statements which are irrelevant - applies to neutral answers
<b>allow/accept</b>	= answers that can be accepted
(words)	= words which are not essential to gain credit
<u>words</u>	= underlined words must be present in answer to score a mark
ecf	= error carried forward
AW/owtte	= alternative wording
ORA	= or reverse argument

*eg mark scheme shows 'work done in lifting / (change in) gravitational potential energy' (1)*

*"work done" = 0 marks*

*"work done lifting" = 1 mark*

*"change in potential energy" = 0 marks*

*"gravitational potential energy" = 1 mark*

5. Annotations:

The following annotations are available on SCORIS.

✓	= correct response
✗	= incorrect response
bod	= benefit of the doubt
nbod	= benefit of the doubt <b>not</b> given
ECF	= error carried forward
^	= information omitted
I	= ignore
R	= reject

6. If a candidate alters his/her response, examiners should accept the alteration.
7. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

The example below illustrates how to apply this principle to an objective question.

eg for a one mark question, where ticks in boxes 3 and 4 are required for the mark

Put ticks (✓) in the two correct boxes.

✓
✗

*This would be worth zero marks.*

Put ticks (✓) in the two correct boxes.

✗
✗

*This would be worth one mark.*

Put ticks (✓) in the two correct boxes.

✗
✗
✓
✓

*This would be worth one mark.*

8. The list principle:

If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, eg one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

9. Marking method for tick boxes:

Always check the additional guidance.

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.

If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, eg shading or crosses.

Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

eg if a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third should be blank (or have indication of choice crossed out).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

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Question			Expected Answers	Marks	Additional Guidance
1	(a)		<div style="text-align: right;"> <input type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/>  does not break ... less dense <input checked="" type="checkbox"/> (1) </div>	[1]	tick in any other box = 0 marks

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Question		Expected Answers	Marks	Additional Guidance
1	(b)	any correct example and use  property with explanation relevant to example.	[1]  [2]	if the material is glass, 0 marks for whole question  first mark is for both the material <u>and</u> the use  must be a material, not the name of an object. material being replaced must not be a plastic eg polystyrene cups = 0 marks cardboard box = 1 mark  reasons must be correct for context given eg iron used in buckets(1) lighter to carry(1) and does not rust(1)  examples of possible reasons  easier to make                      stronger                      transparent doesn't tear                      cost                      waterproof plastic rots less easily [even for chairs!]  even though there may be 0 marks for the first point, credit may still be given for reasons if they make sense – but they must have made some partial suggestion for the material+use  eg “metal used for coke cans” loses first mark, but may get the rest eg blank line, then ‘plastic bags’ then ‘weigh less & more flexible’ = 2 marks <b>allow</b> ‘plastic easier to recycle than pottery’ [but see ignore section for others]  <b>ignore</b> plastic chairs stronger than wooden ones plastic is easier to recycle than metal/paper/wood volume of plastic is less reference to biodegradable plastics safety unless suitably qualified plastic lighter than cardboard using plastic saves trees
		<b>Total</b>	<b>[4]</b>	

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Question			Expected Answers	Marks	Additional Guidance
2	(a)		46.5% (1)	[1]	a ring around any other number = 0 marks
	(b)	(i)	C (1)	[1]	Any other letter = 0 marks
		(ii)	A (1)	[1]	Any other letter = 0 marks
	(c)		any two reasonable points OR one valid point plus explanation	[2]	examples lowers the need for fuel / crude oil / fossil fuel / coal / gas; that is a non-renewable resource; less need for landfill as waste is removed by burning it / less land used / landfill sites release harmful gases; waste is a renewable resource; energy for transporting to China not used;  <b>ignore</b> cost / eco-friendly / less pollution / change in CO <sub>2</sub> made / global warming related to CO <sub>2</sub>
			<b>Total</b>	<b>[5]</b>	

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Question			Expected Answers	Marks	Additional Guidance
3	(a)	(i)	low density poly(ethene) (1)	[1]	accept LDPE / ldpe / low density polythene do <b>not</b> accept just poly(ethene) / polythene
		(ii)	melamine <b>and</b> vulcanised rubber (1)	[1]	<b>both</b> answers for 1 mark answers can be in either order
	(b)	(i)	<div> <input type="checkbox"/> </div> <div> <input type="checkbox"/> </div> <div> is less flexible <div> <input checked="" type="checkbox"/> </div> </div> <div> <input type="checkbox"/> </div> <div> has polymer chains closer together <div> <input checked="" type="checkbox"/> </div> </div> <div> <input type="checkbox"/> </div>	[1]	<b>both</b> answers for 1 mark  tick in any other box = 0 marks
		ii)	<div> <input type="checkbox"/> </div> <div> <input type="checkbox"/> </div> <div> ... energy used to make ... product <div> <input checked="" type="checkbox"/> </div> (1) </div> <div> ... length of time the product is used <div> <input checked="" type="checkbox"/> </div> (1) </div> <div> <input type="checkbox"/> </div>	[2]	1 mark for each correct tick. 3 ticks deduct 1 mark 4 or 5 ticks = 0 marks
			<b>Total</b>	<b>[5]</b>	



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Question			Expected Answers	Marks	Additional Guidance
4	(a)		Microwaves can be absorbed by ... <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	[1]	tick in any other box = marks
	(b)		<input type="checkbox"/> <input type="checkbox"/> ... more photons per second <input checked="" type="checkbox"/> (1) <input type="checkbox"/>	[1]	tick in any other box = marks
	(c)	(i)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Donna <input checked="" type="checkbox"/> (1)	[1]	tick in any other box = marks

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Question			Expected Answers	Marks	Additional Guidance
4	(c)	(ii)	<div style="display: flex; justify-content: space-between; align-items: center;"> <span>Anne</span> <div style="text-align: center;"> <input checked="" type="checkbox"/> </div> <span>(1)</span> </div> <div style="text-align: center; margin-top: 10px;"> <input type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/> </div>	[1]	tick in any other box = marks
			<b>Total</b>	<b>[4]</b>	

Question			Expected Answers	Marks	Additional Guidance
5			<b>any three from:</b>  description of one natural process linked to an increase in carbon dioxide; description of another natural process linked to an increase in carbon dioxide; description of one natural process linked to a decrease in carbon dioxide; description of another natural process linked to a decrease in carbon dioxide; comment on how an increase and a decrease affect the overall CO <sub>2</sub> ;	[3]	natural processes increasing CO <sub>2</sub> : respiration, volcanoes, forest fires, decay, decomposition etc natural processes decreasing CO <sub>2</sub> : photosynthesis, solution in oceans, fixing by molluscs/corals/etc  <b>accept</b> added to the air / given out / given off / breathe out / exhale for increase in CO <sub>2</sub> ; taken away / taken in / using for decrease in CO <sub>2</sub> ;  <b>ignore</b> animals and plants die  natural processes balance / maintain levels / keep levels steady carbon dioxide with no naming of natural process = 1 mark
			<b>Total</b>	<b>[3]</b>	

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Question			Expected Answers	Marks	Additional Guidance																				
6	(a)	(i)	9 (1)	[1]	allow 'nine'																				
		(ii)	20% (1)	[1]	ring around any other number = 0 marks																				
	(b)		<table><thead><tr><th></th><th>Dr Horton</th><th>Dr Hayward</th><th>both</th><th>neither</th></tr></thead><tbody><tr><td>temp. has risen?</td><td></td><td></td><td>✓</td><td></td></tr><tr><td>correlation?</td><td></td><td></td><td>✓</td><td></td></tr><tr><td>causal mech?</td><td>✓</td><td></td><td></td><td></td></tr></tbody></table>		Dr Horton	Dr Hayward	both	neither	temp. has risen?			✓		correlation?			✓		causal mech?	✓				[1]	all correct for 1 mark
	Dr Horton	Dr Hayward	both	neither																					
temp. has risen?			✓																						
correlation?			✓																						
causal mech?	✓																								
			Total	[5]																					

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Question			Expected Answers							Marks	Additional Guidance								
7	(a)		<table><tr><td></td><td></td><td>(IR)</td><td></td><td>(UV)</td><td>X-Rays</td><td></td></tr></table>									(IR)		(UV)	X-Rays		[1]	ignore contents of other boxes unless X-rays are written twice if X-ray written more than once 0 marks	
		(IR)		(UV)	X-Rays														
	(b)		<div>... partly absorbed by teeth</div> <div><input checked="" type="checkbox"/> (1)</div> <div><input type="checkbox"/></div> <div><input type="checkbox"/></div> <div><input type="checkbox"/></div>							[1]	tick in any other box = 0 marks								
	(c)		<div>... risk is small.</div> <div><input checked="" type="checkbox"/></div> <div><input type="checkbox"/></div> <div><input type="checkbox"/></div> <div>...cannot see what's wrong</div> <div><input checked="" type="checkbox"/></div> <div><input type="checkbox"/></div>							[1]	both ticks needed for 1 mark tick in any other box = 0 marks								
	(d)		<div>...applying the ALARA principle</div> <div><input type="checkbox"/></div> <div><input checked="" type="checkbox"/> (1)</div> <div><input type="checkbox"/></div> <div><input type="checkbox"/></div>							[1]	tick in any other box = 0 marks								
			Total							[4]									

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Question			Expected Answers	Marks	Additional Guidance
8	(a)		scientists <u>working in the same area</u> comment on the study (1) checks the reliability of the study/method (1)	[2]	“checks” must be qualified eg repeat the tests / replicate the tests / show it is biased / show results are made up / ORA
	(b)		sentence 1 and Fat can be deposited in the arteries that lead to the heart muscle (1) sentence 3 and The blood carries the oxygen/glucose the heart muscle needs (1)	[2]	<b>accept</b> “vessels” for “arteries” <b>accept</b> “cholesterol” for “fat”  answers in either order
			<b>Total</b>	<b>[4]</b>	

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Question			Expected Answers	Marks	Additional Guidance																							
9	(a)		<div><div><input type="checkbox"/></div><div><input type="checkbox"/></div><div>Even if they have already had flu ...<input checked="" type="checkbox"/></div><div><input type="checkbox"/></div></div>	[1]	tick in any other box = 0 marks																							
	(b)	<b>any three from:</b> HIV damages the immune system / white blood cells; and vaccinations only work by stimulating the immune system; HIV mutates/changes very quickly; so vaccines become ineffective very quickly/before they have been fully tested;		[3]	<b>ignore</b> virus becomes immune or resistant to the vaccine.  idea that vaccines could work for a short time and then not work because of mutation of HIV virus <b>must</b> be in answer																							
	(c)	<table><tr><th rowspan="2">stage ...</th><th colspan="3">test used to check .....</th></tr><tr><th>effectiveness</th><th>safety</th><th>both</th></tr><tr><td>human cells grown in the laboratory</td><td></td><td></td><td>✓</td></tr><tr><td>animals</td><td></td><td></td><td>✓</td></tr><tr><td>healthy volunteers</td><td></td><td>✓</td><td></td></tr><tr><td>people with the illness</td><td></td><td></td><td>✓</td></tr></table>		stage ...	test used to check .....			effectiveness	safety	both	human cells grown in the laboratory			✓	animals			✓	healthy volunteers		✓		people with the illness			✓	[2]	all 4 correct = 2 marks 2 or 3 correct = 1 mark 1 correct = 0 marks
stage ...	test used to check .....																											
	effectiveness	safety	both																									
human cells grown in the laboratory			✓																									
animals			✓																									
healthy volunteers		✓																										
people with the illness			✓																									

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Question			Expected Answers	Marks	Additional Guidance												
9	(d)	(i)	<div><div></div><div></div><div></div><div>to make the trial ethical<div><div>✓</div></div></div><div></div></div>	[1]	tick in any other box = 0 marks												
		(ii)	<table><tr><td>type of trial</td><td>doctor and patient ...</td><td>only the doctor ...</td><td>neither ...</td></tr><tr><td>blind</td><td></td><td>✓</td><td></td></tr><tr><td>double-blind</td><td></td><td></td><td>✓</td></tr></table>	type of trial	doctor and patient ...	only the doctor ...	neither ...	blind		✓		double-blind			✓	[1]	both correct for one mark
type of trial	doctor and patient ...	only the doctor ...	neither ...														
blind		✓															
double-blind			✓														
	(e)		<div><div>only use antibiotics ...</div><div>always finish a course ...</div><div><div>... important to kill all ... bacteria</div><div></div><div></div><div></div><div>... more often antibiotics ...</div></div></div>	[2]	more than one line from a left hand box = 0 for that box												
			Total	[10]													

**OCR (Oxford Cambridge and RSA Examinations)**  
**1 Hills Road**  
**Cambridge**  
**CB1 2EU**

**OCR Customer Contact Centre**

**14 – 19 Qualifications (General)**

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Facsimile: 01223 552627

Email: [general.qualifications@ocr.org.uk](mailto:general.qualifications@ocr.org.uk)

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**Telephone: 01223 552552**  
**Facsimile: 01223 552553**