

Chemistry A

General Certificate of Secondary Education

Unit **A321/02**: Modules C1, C2, C3 (Higher Tier)

Mark Scheme for January 2013

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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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Annotations

Used in the detailed Mark Scheme:

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
(1)	separates marking points
not/reject	answers which are not worthy of credit
ignore	statements which are irrelevant - applies to neutral answers
allow/accept	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	credit alternative wording / or words to that effect
ORA	or reverse argument

Available in scoris to annotate scripts:

	indicate uncertainty or ambiguity
	benefit of doubt
	contradiction
	incorrect response
	error carried forward
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
	no benefit of doubt

	reject
	correct response
	draw attention to particular part of candidate's response
	information omitted

Subject-specific Marking Instructions

- a. Accept any clear, unambiguous response (including mis-spellings of scientific terms if they are *phonetically* correct, but always check the guidance column for exclusions).
- b. 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.

e.g. for a one-mark question where ticks in the third and fourth boxes are required for the mark:

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

*This would be worth
1 mark.*

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

*This would be worth
0 marks.*

<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

*This would be worth
1 mark.*

- c. 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, e.g. 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.

d. Marking method for tick-box questions:

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 and other markings. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses. Credit should be given according to the instructions given in the guidance column for the question. 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.

e.g. if a question requires candidates to identify cities in England:

Edinburgh	<input type="checkbox"/>
Manchester	<input type="checkbox"/>
Paris	<input type="checkbox"/>
Southampton	<input type="checkbox"/>

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

e. For answers marked by levels of response:

i. **Read through the whole answer from start to finish**

ii. **Decide the level that best fits** the answer – match the quality of the answer to the closest level descriptor

iii. **To determine the mark within the level**, consider the following:

Descriptor	Award mark
A good match to the level descriptor	The higher mark in the level
Just matches the level descriptor	The lower mark in the level

iv. Use the **L1**, **L2**, **L3** annotations in Scoris to show your decision; do not use ticks.

Quality of Written Communication skills assessed in 6-mark extended writing questions include:
















- appropriate use of correct scientific terms
- spelling, punctuation and grammar
- developing a structured, persuasive argument
- selecting and using evidence to support an argument
- considering different sides of a debate in a balanced way
- logical sequencing.

Question		Answer	Marks	Guidance					
1	(a)	<p>More cars and power stations changed to using low sulfur fuels. <input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p>More power stations were fitted with devices to remove sulfur compounds from flue gases <input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	2						
	(b)	<p><i>any three from:</i></p> <p>fuels contain sulfur; (1)</p> <p>as fuel burns it forms sulfur dioxide; (1)</p> <p>(sulfur dioxide) reacts with oxygen; (1)</p> <p>and water (in the air); (1)</p> <p>forms acid rain; (1)</p> <p>falls/comes down into rivers and lakes; (1)</p>	3	<p>do not allow answers based on formation of carbon dioxide or nitrogen oxides</p> <p>do not allow sulfur is released into air and then reacts with oxygen forming sulfur dioxide for the first mark</p> <p>do not allow mixing</p> <p>allow water vapour or moisture for water</p> <p>do not allow goes into rivers and lakes</p>					
	(c)	<p>B and G not included in answer (1)</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="padding: 2px 5px;">A</td> <td style="padding: 2px 5px;">E</td> <td style="padding: 2px 5px;">C</td> <td style="padding: 2px 5px;">F</td> <td style="padding: 2px 5px; background-color: #cccccc;">D</td> </tr> </table> <p>(2)</p>	A	E	C	F	D	3	<p>allow one mark for AEBF</p> <p>allow one mark for three consecutive letters in correct order ie AEC or ECF even if other letter is B or G</p>
A	E	C	F	D					
Total			8						

Question		Answer	Marks	Guidance																									
2	(a)	<table border="1"> <thead> <tr> <th></th> <th colspan="4">number of atom in all molecules of</th> </tr> <tr> <th></th> <th>pentane</th> <th>oxygen</th> <th>carbon dioxide</th> <th>water</th> </tr> </thead> <tbody> <tr> <th>carbon</th> <td>5</td> <td>0</td> <td>5</td> <td>0</td> </tr> <tr> <th>hydrogen</th> <td>12</td> <td>0</td> <td>0</td> <td>12</td> </tr> <tr> <th>oxygen</th> <td>0</td> <td>16</td> <td>10</td> <td>6</td> </tr> </tbody> </table>		number of atom in all molecules of					pentane	oxygen	carbon dioxide	water	carbon	5	0	5	0	hydrogen	12	0	0	12	oxygen	0	16	10	6	3	<p>one mark for each correct row (left to right)</p> <p>any box with no number in it means that row does not score</p>
	number of atom in all molecules of																												
	pentane	oxygen	carbon dioxide	water																									
carbon	5	0	5	0																									
hydrogen	12	0	0	12																									
oxygen	0	16	10	6																									
	(b)	(i)																											
		<p>introduce more cross links <input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p>make force B stronger <input checked="" type="checkbox"/> (1)</p>	2																										
		(ii)																											
		<p><input type="checkbox"/></p> <p>The forces, B, between the polymer chains are stronger; <input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p> <p>The polymer chains are closer to each other. <input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p>	2																										
Total			7																										

Question		Answer	Marks	Guidance
3	(a)	<p>first mark for idea that making new paper and making recycled paper involves a difference in energy used/pollution created/is more efficient</p> <p>plus any two differences between new and recycled paper shown in the diagram, from:</p> <p><i>1 transport</i> transporting/collecting waste paper for recycling may be for greater distance than transporting cut trees for new paper;</p> <p><i>2 de-inking and bleaching</i> recycled paper has to be de-inked/bleached but not new paper;</p> <p><i>3 screening and cleaning</i> contaminants are different for new and recycled paper (so screening and cleaning is different)</p> <p><i>4 replanting</i> trees can be replanted</p>	3	<p>do not allow marks for answers that only refer to cutting trees being less sustainable because it reduces number of trees etc/recycled paper being more sustainable since it re-uses material rather than using up resources etc</p> <p>first marking point must refer to energy used or pollution created or environmental impact being less for new paper <u>or</u> replanting replaces raw material</p> <p>examples of differences between new paper and recycled paper must be from the diagram to score marks and show a benefit for new paper</p> <p>accept implied differences</p>
	(b)	<p>idea of books having a longer lifetime/being stored in libraries/idea of packaging being produced every day/in larger quantities/packaging discarded (1)</p> <p>idea related to different pollution/energy issues from manufacture or disposal in landfill/by burning eg packaging fill more landfill (1)</p>	2	<p>ignore idea that a book uses less paper</p> <p>first mark is for difference in use of books and packaging</p> <p>second mark is for how this affects energy/pollution</p> <p>second mark must be linked to first</p>

Question		Answer	Marks	Guidance
	(c)	<p>It is cheaper to recycle waste paper in China than in the UK.</p> <p>The large number of containers that might otherwise be empty on the return journey after bringing imports from China make it cheaper to ship the waste paper.</p>	<p>2</p> <p><input type="checkbox"/></p> <p><input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input checked="" type="checkbox"/></p>	
Total			7	

Question		Answer	Marks	Guidance																				
4	(a)	<p><i>any two from:</i></p> <p>it enables an average/mean to be calculated;</p> <p>it allows outliers to be identified (and discarded);</p> <p>it allows for differences in samples/it allows for errors in equipment/it allows for errors in technique/one measurement may be in error;</p>	2	<p>do not allow to obtain a best estimate</p> <p>allow it increases the reliability/accuracy (of the best estimate)</p>																				
	(b)	<p>$(0.178 + 0.180 + 0.177 + 0.177) / 4$ (1)</p> <p>0.178 (1)</p>	2	<p>2 marks for correct answer</p> <p>allow 1 mark for 0.174</p>																				
	(c)	<table style="width: 100%; border: none;"> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;">(1)</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;">(1)</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> </table>	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input checked="" type="checkbox"/>	(1)	<input type="checkbox"/>		<input type="checkbox"/>		<input checked="" type="checkbox"/>		<input type="checkbox"/>	(1)	<input type="checkbox"/>		<input type="checkbox"/>		2	
<input type="checkbox"/>		<input type="checkbox"/>																						
<input type="checkbox"/>		<input checked="" type="checkbox"/>	(1)																					
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<input checked="" type="checkbox"/>		<input type="checkbox"/>	(1)																					
<input type="checkbox"/>		<input type="checkbox"/>																						
Total			6																					

Question		Answer	Marks	Guidance
5	(a)	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> Organic farming is more sustainable <input type="checkbox"/> </div> <div style="width: 45%; text-align: center;"> but there is not enough animal waste to provide sufficient fertiliser. </div> <div style="width: 45%;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> </div> </div>	2	
	(b)	<p>Crops grown using intensive farming methods produce higher yields for the same area of land used.</p> <p>The population in the UK is much larger now than it was two hundred years ago.</p>	2	

Question		Answer	Marks	Guidance
	(c)	<p>Intensively grown apples may contain toxic pesticide residues.</p> <p style="text-align: right;"> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> </p> <p>Organically grown apples have been produced with less damage to the environment.</p>	2	
Total			6	

Question		Answer	Marks	Guidance
6	(a)	<p style="text-align: right;"><input type="checkbox"/></p> <p>Sorbic acid has been approved for use in the EU.</p> <p style="text-align: right;"><input checked="" type="checkbox"/></p> <p>Sorbic acid has passed a safety test.</p> <p style="text-align: right;"><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	2	

Question		Answer	Marks	Guidance
	(b)	<p>Research has shown no link between sorbic acid and harmful effects.</p> <p>One person could not realistically consume enough litres of drinks containing sorbic acid to exceed the maximum daily dose of sorbic acid</p>	2	
	(c) (i)	<p>what is the chance/risk that they will be harmed by sorbic acid (1)</p> <p>how serious would the harm caused by sorbic acid be/what damage it may cause (1)</p>	2	<p>answers must be based on chance and consequence ignore risk and benefit answers</p> <p>allow the same ideas expressed with different wording</p> <p>allow how much (sorbic acid) you drink</p> <p>ignore vague references to effect on the body, amount in drinks or how much causes harm</p>
	(ii)	<p>do not know the risk; (1)</p> <p>so do not consume any preservatives; (1)</p>	2	<p>allow one mark for 'it is better to be safe than sorry' if neither of the other two marking points have scored</p> <p>ignore 'don't want to take the risk' unless qualified</p> <p>ignore references to allergies</p> <p>ignore risk and benefit answers</p> <p>ignore references to ALARA</p>
Total			8	

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