

**Chemistry A**

General Certificate of Secondary Education

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

**Mark Scheme for January 2012**

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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:

<b>Annotation</b>	<b>Meaning</b>
/	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
words	underlined words must be present in answer to score a mark
ecf	error carried forward
AW/owtte	alternative wording
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. If a candidate alters his/her response, examiners should accept the alteration.
- 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 boxes 3 and 4 are required for the mark:

Put ticks (✓) in the two correct boxes.

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

This would be worth 1 mark.

Put ticks (✓) in the two correct boxes.

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

This would be worth 0 marks.

Put ticks (✓) in the two correct boxes.

<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, 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.

d. 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.

e.g. If a question requires candidates to identify a city in England, then in the boxes

<b>Edinburgh</b>	
<b>Manchester</b>	
<b>Paris</b>	
<b>Southampton</b>	

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).

<b>Edinburgh</b>			✓			✓	✓	✓	✓	
<b>Manchester</b>	✓	x	✓	✓	✓				✓	
<b>Paris</b>				✓	✓		✓	✓	✓	
<b>Southampton</b>	✓	x		✓		✓	✓		✓	
<b>Score:</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>NR</b>

Question			Answer	Marks	Guidance
1	(a)	(i)	12 (2)	2	<b>allow</b> one mark for 14 (outlier included) <b>allow</b> one mark for correct working with wrong answer
		(ii)	range is small / results are very close / values nearly the same / no outliers (1) repeatability is high/good (1)	2	<b>ignore</b> idea of needing to repeat readings <b>allow</b> results are reliable / results have high reliability
		(iii)	<div style="border: 1px solid black; width: 100%; height: 20px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 100%; height: 20px; margin-bottom: 5px; display: flex; justify-content: space-between; align-items: center;"> <span>The ranges for Town A and for Town B...</span> <input checked="" type="checkbox"/> (1)         </div> <div style="border: 1px solid black; width: 100%; height: 20px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 100%; height: 20px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 100%; height: 20px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 100%; height: 20px; margin-bottom: 5px; display: flex; justify-content: space-between; align-items: center;"> <span>The mean for town B is outside the range...</span> <input checked="" type="checkbox"/> (1)         </div>	2	
	(b)		measurements for town <b>B</b> are higher (than town <b>A</b> ) (1) town <b>B</b> has cars (in centre) but Town <b>A</b> does not (1) statement linking the two eg correlation / causal link (1)	3	town B has more carbon/particulates  <b>allow</b> town <b>B</b> has more cars  if no mention of town <b>A</b> or <b>B</b> max 1  <b>allow</b> reverse argument  <b>ignore</b> references to pollution that do not mention carbon/particulates
<b>Total</b>				<b>9</b>	

Question		Answer	Marks	Guidance
2	(a)	5 (1) 4 (1)	2	one mark for each correct number no mark if wrong way round, i.e. 4 5
	(b)	hydrogen oxygen 8 10 8 10	2	one mark for each correct <b>row</b>
	(c)	carbon (1) and carbon monoxide (1)	2	either order <b>allow</b> carbon particulates but do not allow particulates
<b>Total</b>			<b>6</b>	

Question		Answer	Marks	Guidance
3	(a)	<div style="border: 1px solid black; width: 100%; height: 20px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 100%; height: 20px; margin-bottom: 5px; display: flex; justify-content: space-between; align-items: center;"> <span>Crude oil can be separated into a number...</span> <input checked="" type="checkbox"/> <span>(1)</span> </div> <div style="border: 1px solid black; width: 100%; height: 20px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 100%; height: 20px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 100%; height: 20px; margin-bottom: 5px; display: flex; justify-content: space-between; align-items: center;"> <span>The molecules in crude oil have different chain...</span> <input checked="" type="checkbox"/> <span>(1)</span> </div> <div style="border: 1px solid black; width: 100%; height: 20px; margin-bottom: 5px;"></div>	2	
	(b)	hydrogen carbon (1)	1	<b>both</b> required, either order
	(c)	lubricants / lubricating oil (1) raw materials for chemical synthesis (1)	2	<b>allow</b> 'oil' but do not allow 'crude oil' <b>allow</b> raw materials / chemical synthesis / feedstock
<b>Total</b>			<b>5</b>	

Question	Answer	Marks	Guidance																
<p>4 (a)</p>	<p><i>argument for wood being more sustainable:</i> uses less energy / uses less fossil fuel / produces less carbon dioxide / causes less air acidification (1)</p> <p><i>argument for uPVC being more sustainable:</i> produces less air pollutants / causes less water pollution (1)</p> <p>decision that data show wood is more sustainable based on data from the table (1)</p> <p>plus: an idea of <b>how</b> this is more sustainable: eg fossil fuels finite/cause pollution / carbon dioxide causes global warming / air pollution causes smog / water pollution kills fish (1)</p>	<p>4</p>	<p><b>allow</b> reverse argument for each marking point eg uPVC less sustainable because uses more energy</p> <p>no mark for quoting numbers without qualification</p>																
<p>(b)</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%; height: 25px;"></td> <td style="width: 20%;"></td> </tr> <tr> <td style="height: 25px;"></td> <td></td> </tr> <tr> <td style="height: 25px;">Trees can be grown to get more wood.</td> <td style="text-align: center;">✓</td> </tr> <tr> <td style="height: 25px;"></td> <td style="text-align: right;">(1)</td> </tr> <tr> <td style="height: 25px;"></td> <td></td> </tr> <tr> <td style="height: 25px;">uPVC is made from chemicals in crude oil...</td> <td style="text-align: center;">✓</td> </tr> <tr> <td style="height: 25px;"></td> <td style="text-align: right;">(1)</td> </tr> <tr> <td style="height: 25px;"></td> <td></td> </tr> </table>					Trees can be grown to get more wood.	✓		(1)			uPVC is made from chemicals in crude oil...	✓		(1)			<p>2</p>	
Trees can be grown to get more wood.	✓																		
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	(1)																		



Question		Answer	Marks	Guidance
4	(c)	<div style="border: 1px solid black; width: 100%; height: 20px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 100%; height: 20px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 100%; height: 20px; margin-bottom: 5px; display: flex; justify-content: space-between; align-items: center;"> <span>The forces of attraction between polymer chains...</span> <input checked="" type="checkbox"/> (1)         </div> <div style="border: 1px solid black; width: 100%; height: 20px;"></div>	1	
	(d)	<p><b>any two from:</b></p> <p><b>decrease</b> chain length / make chains <b>short/shorter</b> ;</p> <p><b>decrease</b> crystallinity / <b>decrease</b> density / <b>decrease</b> packing ;</p> <p><b>reduce</b> cross linking / <b>less</b> cross links / <b>no</b> cross links (2)</p>	2	<p><b>allow</b> not crystalline / less crystalline</p> <p><b>allow</b> increase branching / add branches</p> <p>be careful to look for the command words eg decrease</p> <p><b>allow</b> less/take away = decrease</p>
<b>Total</b>			<b>9</b>	

Question		Answer	Marks	Guidance																		
5	(a) (i)	<table border="1"> <thead> <tr> <th></th> <th>true (✓)</th> <th>false (✓)</th> </tr> </thead> <tbody> <tr> <td>They help to mix ingredients ...</td> <td>✓</td> <td></td> </tr> <tr> <td>They prevent the growth ...</td> <td></td> <td>✓</td> </tr> <tr> <td>They reduce the amount of sugar ...</td> <td></td> <td>✓</td> </tr> <tr> <td>They prevent ingredients ...</td> <td>✓</td> <td></td> </tr> <tr> <td>They help to separate ...</td> <td></td> <td>✓</td> </tr> </tbody> </table>		true (✓)	false (✓)	They help to mix ingredients ...	✓		They prevent the growth ...		✓	They reduce the amount of sugar ...		✓	They prevent ingredients ...	✓		They help to separate ...		✓	2	all five correct = 2 marks three or four correct = 1 mark  if any row has two ticks, do not count either tick
	true (✓)	false (✓)																				
They help to mix ingredients ...	✓																					
They prevent the growth ...		✓																				
They reduce the amount of sugar ...		✓																				
They prevent ingredients ...	✓																					
They help to separate ...		✓																				
	(ii)	added to fats/oils (1) (fats and oils) become rancid/deteriorate/have short shelf life / prevents going rancid/deterioration (1) (antioxidants) prevent reaction with oxygen / prevents oxidation (1)	3	<b>allow</b> foods high in fat/oil eg butter/cheese <b>do not allow</b> idea of rotting/decay/bacterial attack <b>allow</b> to prolong shelf life / stop 'going off' if contradiction eg prevents oxidation and prevents mould, this mark is lost																		
	(b)	<table border="1"> <tbody> <tr> <td>They have passed a safety test.</td> <td>✓</td> <td>(1)</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>They are approved for use in the EU.</td> <td>✓</td> <td>(1)</td> </tr> </tbody> </table>	They have passed a safety test.	✓	(1)										They are approved for use in the EU.	✓	(1)	2				
They have passed a safety test.	✓	(1)																				
They are approved for use in the EU.	✓	(1)																				
	(c)	<b>any two from:</b> natural chemicals in plants (may be toxic/harmful) ; moulds/fungi/bacteria contaminate crops (during storage) ; (toxic/harmful chemicals) may form during food processing/cooking (2)	2	<b>ignore</b> all references to pesticides/herbicides/fertilisers <b>ignore</b> reference to E numbers/insects/manure/packaging  <b>do not allow</b> idea that toxic chemicals are not destroyed during cooking																		
<b>Total</b>			<b>9</b>																			

Question		Answer	Marks	Guidance
6	(a)	<p><b>any two from:</b>                      risk is small ;                      benefit outweighs risk ;                      amount of pesticides/herbicides is small ;                      these chemicals have been tested/approved ;                      people do not think about/do not know the risk / people think there is no risk ;                      people have to eat ;                      this food is cheaper / organic food is expensive ;                      they wash residues off the food (2)</p>	2	
	(b)	<p>we are not sure whether synthetic pesticides... <input type="checkbox"/></p> <p><input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p>organic farming methods do not use... <input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p>	2	
<b>Total</b>			<b>4</b>	

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