

**Chemistry A**  
**Twenty First Century Science**

General Certificate of Secondary Education **J634**

**Mark Scheme for the Units**

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**June 2009**

**J634/MS/R/09**

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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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## CONTENTS

### GCSE Twenty First Century Science – Chemistry A (J634)

#### MARK SCHEMES FOR THE UNITS

<b>Unit/Content</b>	<b>Page</b>
Guidance for Examiners	1
A321/01 Modules C1, C2, C3 Foundation Tier	3
A321/02 Modules C1, C2, C3 Higher Tier	12
A322/01 Modules C4, C5, C6 Foundation Tier	22
A322/02 Modules C4, C5, C6 Higher Tier	32
A323/01 Unit 3 Ideas in Context plus C7 Foundation Tier	42
A323/02 Unit 3 Ideas in Context plus C7 Higher Tier	46
Grade Thresholds	53

## 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. If a candidate alters his/her response, examiners should accept the alteration.
6. 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.

7. 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.

8. 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

## A321/01 Modules C1, C2, C3 Foundation Tier

Question		Expected Answers	Marks	Rationale	
1	a		4	<p>Mark left and right hand sides independently</p> <p>Matching name to formula – two marks for all correct, one mark for two or three correct. (max 2)</p> <p>Matching formula to molecule – two marks for all correct, one mark for two or three correct (max 2)</p> <p>If 2 lines leave or arrive at one box then the mark is lost</p>	
	b	i	sulfur dioxide/nitrogen monoxide/SO <sub>2</sub> /NO	1	either formula must be correct if used
		ii	carbon monoxide/CO	1	formula must be correct if used
		iii	water (vapour)/H <sub>2</sub> O	1	formula must be correct if used
<b>Total</b>			<b>7</b>		

Question			Expected Answers	Marks	Rationale								
2	a		<p>... reliable results</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px; text-align: center;">✓</td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> </table> <p>(1)</p>			✓		1	3 <sup>rd</sup> box				
✓													
	b	i	<p>... well outside the range ...</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px; text-align: center;">✓</td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> </table> <p>(1)</p>		✓			1	2 <sup>nd</sup> box				
✓													
		ii	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px; text-align: center;">✓</td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px; text-align: center;">✓</td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> </table> <p>... wind changed direction ... (1)</p> <p>... burned less coal ... (1)</p>					✓		✓		2	4 <sup>th</sup> and 5 <sup>th</sup> boxes
✓													
✓													

Question		Expected Answers	Marks	Rationale
2	c	311; 297 to 322;	2	one mark for each correct answer <b>accept</b> 314/314.5/315 for the mean <b>If</b> 314/314.5/315 is given for the mean <b>then allow</b> 307 to 322 for the range Numbers for a range can be given in either order
	d	decreases decreases <b>OR</b> increases increases	1	both correct words required – (must be same word used twice)
		<b>Total</b>	<b>7</b>	



Question		Expected Answers	Marks	Rationale							
3	a	<p>... using the spoon</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td>✓ (1)</td></tr> <tr><td> </td></tr> </table>			✓ (1)		1	3 <sup>rd</sup> box			
✓ (1)											
	b	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td>Supply of metal ores is finite. ✓ (1)</td></tr> <tr><td> </td></tr> <tr><td>More trees can be planted ... ✓ (1)</td></tr> <tr><td> </td></tr> <tr><td>Plastics made from crude oil ... ✓ (1)</td></tr> <tr><td> </td></tr> </table>		Supply of metal ores is finite. ✓ (1)		More trees can be planted ... ✓ (1)		Plastics made from crude oil ... ✓ (1)		3	2 <sup>nd</sup> , 4 <sup>th</sup> and 6 <sup>th</sup> boxes
Supply of metal ores is finite. ✓ (1)											
More trees can be planted ... ✓ (1)											
Plastics made from crude oil ... ✓ (1)											

Question		Expected Answers	Marks	Rationale
3	c	<div style="display: flex; align-items: center; margin-bottom: 5px;"> <div style="flex: 1;">... metal spoon not stained...</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 5px;"></div> <div style="margin-left: 5px;">(1)</div> </div> <div style="display: flex; align-items: center; margin-bottom: 5px;"> <div style="flex: 1;">... plastic spoon too soft ...</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 5px;"></div> <div style="margin-left: 5px;">(1)</div> </div> <div style="display: flex; align-items: center; margin-bottom: 5px;"> <div style="flex: 1;">... wooden spoon stained ...</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 5px;"></div> <div style="margin-left: 5px;">(1)</div> </div> <div style="display: flex; align-items: center; margin-bottom: 5px;"> <div style="flex: 1;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 5px;"></div> </div> <div style="display: flex; align-items: center;"> <div style="flex: 1;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 5px;"></div> </div>	3	2 <sup>nd</sup> , 3 <sup>rd</sup> and 5 <sup>th</sup> boxes
<b>Total</b>			<b>7</b>	










Question		Expected Answers	Marks	Rationale
4	a	cotton <u>polyester</u> silk    wool	1	correct word circled and no other words circled
	b	small; long; polymerisation;	3	one mark for each correct choice
	c	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">                     carbon  <input checked="" type="checkbox"/>                      (1)                 </div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <div style="text-align: center;">                     hydrogen  <input checked="" type="checkbox"/>                      (1)                 </div> </div>	2	1 <sup>st</sup> and 4 <sup>th</sup> boxes
	ii	food <u>fuels</u> lubricants	1	
<b>Total</b>			<b>7</b>	

Question			Expected Answers	Marks	Rationale
5	a	i	<p>Plants take nitrogen ... <input checked="" type="checkbox"/> (1)</p> <p>When crops are harvested ... <input checked="" type="checkbox"/> (1)</p>	2	2 <sup>nd</sup> and 5 <sup>th</sup> boxes
		ii	<p>calcium <input type="checkbox"/> carbon <input checked="" type="checkbox"/> chlorine <input checked="" type="checkbox"/> hydrogen <input checked="" type="checkbox"/></p> <p>neon <input type="checkbox"/> oxygen <input checked="" type="checkbox"/> sodium <input type="checkbox"/></p>	2	<p>all three correct words circled and no others circled for 2 marks</p> <p>two correct words circled for one mark</p> <p>marks are lost if more than three words are circled</p>
	b	i	<p>Some crops naturally contain toxic ... <input checked="" type="checkbox"/> (1)</p> <p>During storage, crops contaminated ... <input checked="" type="checkbox"/> (1)</p>	2	1 <sup>st</sup> and 5 <sup>th</sup> boxes

Question			Expected Answers	Marks	Rationale				
5	b	ii	... safe levels of chemicals ... <table border="1"><tr><td></td></tr><tr><td></td></tr><tr><td>✓</td></tr><tr><td></td></tr></table> (1)			✓		1	3 <sup>rd</sup> box
✓									
<b>Total</b>				<b>7</b>					

Question		Expected Answers	Marks	Rationale
6	a	<p>amino acids      amino acids</p> <p>urine              urea</p>	4	one mark for each correct choice, correctly placed.
	b		2	<p>one mark for each correct 'row' linking type of diabetes to both the correct description and the correct treatment</p> <p>More than one line leaving or arriving at a box loses the mark</p>
	c	<p><b>anorexia    asthma    <u>obesity</u>    sunburn</b></p>	1	one mark for the correct word and no other circled
<b>Total</b>			<b>7</b>	

## A321/02 Modules C1, C2, C3 Higher Tier

Question		Expected Answers	Marks	Rationale									
1	a	<table border="1"> <tbody> <tr> <td>sulfur dioxide</td> <td>SO<sub>2</sub></td> <td></td> </tr> <tr> <td>nitrogen monoxide</td> <td>NO</td> <td></td> </tr> <tr> <td>carbon monoxide</td> <td>CO</td> <td></td> </tr> </tbody> </table>	sulfur dioxide	SO <sub>2</sub>		nitrogen monoxide	NO		carbon monoxide	CO		3	<p>one mark for each correct row  do not allow SO<sup>2</sup>/SO<sub>2</sub>/sO<sub>2</sub>  do not allow sulfur oxide/sulfur monoxide/sulfur trioxide  <b>allow</b> sulfur(IV) oxide  do not allow nitrogen oxide/nitrogen dioxide/nitrous oxide  <b>allow</b> nitric oxide/nitrogen(II) oxide  do not allow No/nO  do not allow carbon oxide/carbon dioxide  <b>allow</b> carbon(II) oxide  do not allow Co/cO</p>
sulfur dioxide	SO <sub>2</sub>												
nitrogen monoxide	NO												
carbon monoxide	CO												
	b	[1] [3] [2] [2]	3	one mark for each correct number after [1]									
<b>Total</b>			<b>6</b>										

Question		Expected Answers	Marks	Rationale								
2	a	<p>... reliable results</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td>✓ (1)</td></tr> <tr><td> </td></tr> </table>			✓ (1)		1	3 <sup>rd</sup> box				
✓ (1)												
	b i	<p>... well outside the range ...</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td>✓ (1)</td></tr> <tr><td> </td></tr> <tr><td> </td></tr> </table>		✓ (1)			1	2 <sup>nd</sup> box				
✓ (1)												
	ii	<p>... wind changed direction ...</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td>✓ (1)</td></tr> </table> <p>... burned less coal ...</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td>✓ (1)</td></tr> </table>				✓ (1)				✓ (1)	2	4 <sup>th</sup> and 5 <sup>th</sup> boxes
✓ (1)												
✓ (1)												



Question			Expected Answers	Marks	Rationale
2	c		<div style="display: flex; align-items: center; justify-content: center;"> <div style="margin-right: 10px;">... ranges don't overlap.</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> <div style="margin-right: 10px;">(1)</div> </div> <div style="display: flex; align-items: center; justify-content: center; margin-top: 10px;"> <div style="margin-right: 10px;">... mean before is outside range after ...</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> <div style="margin-right: 10px;">(1)</div> </div>	2	3 <sup>rd</sup> and 5 <sup>th</sup> boxes
	d	i	A (1)	1	no mark if two or more letters are quoted
		ii	D (1)	1	no mark if two or more letters are quoted
<b>Total</b>				<b>8</b>	

Question		Expected Answers	Marks	Rationale							
3	a	<p>... using the spoon</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td>✓ (1)</td></tr> <tr><td> </td></tr> </table>			✓ (1)		1	3 <sup>rd</sup> box			
✓ (1)											
	b	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td>Supply of metal ores is finite. ✓ (1)</td></tr> <tr><td> </td></tr> <tr><td>More trees can be planted ... ✓ (1)</td></tr> <tr><td> </td></tr> <tr><td>Plastics made from crude oil ... ✓ (1)</td></tr> <tr><td> </td></tr> </table>		Supply of metal ores is finite. ✓ (1)		More trees can be planted ... ✓ (1)		Plastics made from crude oil ... ✓ (1)		3	2 <sup>nd</sup> , 4 <sup>th</sup> and 6 <sup>th</sup> boxes
Supply of metal ores is finite. ✓ (1)											
More trees can be planted ... ✓ (1)											
Plastics made from crude oil ... ✓ (1)											

Question		Expected Answers	Marks	Rationale
3	c	<p>... use and disposal ...</p> <p style="text-align: center;"> <input type="checkbox"/>  <input checked="" type="checkbox"/> (1)  <input type="checkbox"/>  <input checked="" type="checkbox"/> (1)  <input type="checkbox"/> </p> <p>... making the product from the material.</p>	2	2 <sup>nd</sup> and 4 <sup>th</sup> boxes
	d	<p>... available locally ...</p> <p style="text-align: center;"> <input checked="" type="checkbox"/>  <input type="checkbox"/>  <input checked="" type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/> </p> <p>It is easy to make wooden spoons ...</p>	1	<p><b>both</b> 1<sup>st</sup> and 3<sup>rd</sup> boxes for one mark</p> <p>three or more boxes ticked = 0 marks</p>
		<b>Total</b>	<b>7</b>	

Question			Expected Answers	Marks	Rationale
4	a	i	B C D	1	one mark for <b>any two</b> of these three correct letters in any order allow the mark if all three correct letters are given do not allow the mark if incorrect letter A is given
		ii	A D	1	one mark for <b>both</b> correct letters in either order do not allow the mark if more than two letters are given
		iii	A D	1	one mark for <b>both</b> correct letters in either order do not allow the mark if more than two letters are given
	b		<p>... less plasticizer ... <input checked="" type="checkbox"/> (1)</p> <p style="text-align: center;"> <input type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/> </p> <p>Increase chain length ... <input checked="" type="checkbox"/> (1)</p>	2	1 <sup>st</sup> and 5 <sup>th</sup> boxes
	c		<p>... forces between the molecules. <input checked="" type="checkbox"/></p> <p style="text-align: center;"> <input type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/> </p> <p>... forces between the polymer chains stronger. <input checked="" type="checkbox"/></p> <p>... but weak forces between ... <input checked="" type="checkbox"/></p> <p style="text-align: center;"> <input type="checkbox"/> </p>	2	<p><b>all three</b> of 1<sup>st</sup>, 4<sup>th</sup> and 5<sup>th</sup> boxes for <b>two marks</b></p> <p>two boxes correct with or without a third incorrect one = one mark</p> <p>four boxes ticked = max one mark ie only gets the mark if all three correct boxes are included</p> <p>five or six boxes ticked = 0 marks</p>
<b>Total</b>				<b>7</b>	

Question			Expected Answers	Marks	Rationale
5	a	i	<p>Plants take nitrogen ... <input type="checkbox"/> ✓ (1)</p> <p>When crops are harvested ... <input type="checkbox"/> ✓ (1)</p>	2	2 <sup>nd</sup> and 5 <sup>th</sup> boxes
		ii	carbon (1) and hydrogen (1)	2	one mark for each correct word, in either order for three words max 1 mark, for four words no marks for hydrogen allow H or H <sub>2</sub> but not h or h <sub>2</sub> for carbon allow C but not C <sub>2</sub> etc
	b	i	<p>Some crops naturally contain toxic ... <input type="checkbox"/> ✓ (1)</p> <p>During storage, crops contaminated ... <input type="checkbox"/> ✓ (1)</p>	2	1 <sup>st</sup> and 5 <sup>th</sup> boxes

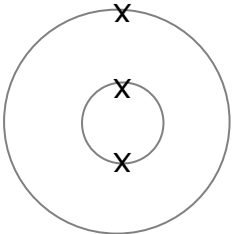
Question			Expected Answers	Marks	Rationale
5	b	ii	<p>... easier to make ... <input checked="" type="checkbox"/></p> <p>... more expensive ... <input checked="" type="checkbox"/></p>	1	<p><b>both</b> 1<sup>st</sup> and 3<sup>rd</sup> boxes for one mark</p> <p>three or more boxes ticked = 0 marks</p>
<b>Total</b>				<b>7</b>	

Question		Expected Answers	Marks	Rationale
6	a	amino acids liver urea kidney(s) urine	3	all five words correct for 3 marks four words correct for 2 marks three words correct for 1 mark  do not allow monomers for amino acids
	b	<div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: right; padding-right: 10px;">                         ... pancreas does not produce                          enough ...                           Sugar ... is quickly absorbed ...                             ... to regulate the amount of sugar                          ...                     </div> <div style="border: 1px solid black; padding: 2px;"> <input type="checkbox"/>  <input checked="" type="checkbox"/>  <input checked="" type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/>  <input checked="" type="checkbox"/> </div> </div>	2	all three of 2 <sup>nd</sup> , 3 <sup>rd</sup> and 6 <sup>th</sup> boxes for two marks  two boxes correct with or without a third one incorrect for one mark  four boxes ticked = max one mark ie only gets the mark if all three correct boxes are included  five or six boxes ticked = 0 marks

Question		Expected Answers	Marks	Rationale							
6	c	<p>the chance ... contracting type 2 ...</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px; text-align: center;">✓</td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px; text-align: center;">✓</td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> </table> <p style="margin-left: 100px;">(1)</p> <p>the consequences of ... diabetes</p> <p style="margin-left: 100px;">(1)</p>		✓				✓		2	2 <sup>nd</sup> and 5 <sup>th</sup> boxes
✓											
✓											
<b>Total</b>			<b>7</b>								



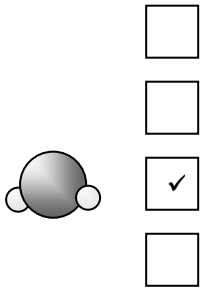
## A322/01 Modules C4, C5, C6 Foundation Tier

Question		Expected Answers	Marks	Rationale															
1	a	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 20%; text-align: center;">true</th> <th style="width: 20%; text-align: center;">false</th> </tr> </thead> <tbody> <tr> <td>... reacts with cold water.</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>... to form compounds.</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>... quicker than potassium.</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>... is very unstable.</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> </tbody> </table>		true	false	... reacts with cold water.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	... to form compounds.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	... quicker than potassium.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	... is very unstable.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	2	<p>all 4 correct = 2 2 or 3 correct = 1 1 correct = 0</p> <p><b>Accept</b> other indications of choice (eg lines or crosses)</p>
	true	false																	
... reacts with cold water.	<input checked="" type="checkbox"/>	<input type="checkbox"/>																	
... to form compounds.	<input type="checkbox"/>	<input checked="" type="checkbox"/>																	
... quicker than potassium.	<input type="checkbox"/>	<input checked="" type="checkbox"/>																	
... is very unstable.	<input type="checkbox"/>	<input checked="" type="checkbox"/>																	
	b	i	protons (1) neutrons (1)	2	either order														
		ii	3 electrons arranged 2 inside the inner shell, 1 in the outer shell	1															
<b>Total</b>			<b>5</b>																

Question			Expected Answers	Marks	Rationale
2	a	i	<p>Diagram description: A box labeled 'solid iodine' has a line connecting to a box labeled 'dark grey'. A box labeled 'iodine gas' has a line connecting to a box labeled 'purple'. There are also four empty boxes stacked vertically to the right of the text.</p>	2	<p>(1) mark for each correct line.</p> <p>If more than 2 lines are drawn, deduct (1) for each additional incorrect line.</p>
		ii	<p>Do experiments in a fume cupboard. <input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p>Do not breathe in the gas. <input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p>	2	<p><b>Accept</b> other indications of choice (eg lines or crosses)</p>

Question		Expected Answers	Marks	Rationale
2	b	<p>Iodine solution kills bacteria.</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p>	1	<b>Accept</b> other indications of choice (eg lines or crosses)
			5	

Question		Expected Answers	Marks	Rationale
3	a	<p>the colour of the flame</p> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1	Accept other indications of choice (eg lines or crosses)
	b	<p>a fixed pattern of lines</p> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1	Accept other indications of choice (eg lines or crosses)
	c	<p>potassium (1)  chlorine (1)</p>	2	either order <b>accept</b> any phonetic spellings <b>reject</b> 'chloride'
		<b>Total</b>	<b>4</b>	

Question		Expected Answers	Marks	Rationale
4	a		1	If more than 1 box is ticked, 0 marks
	b	<p>C and H only in the formula (1)</p> <p>Fully correct formula: C<sub>2</sub>H<sub>4</sub> (2)</p>	2	<p>C and H must be capitals eg CH<sub>4</sub> scores (0) C<sub>2</sub>h<sub>4</sub> scores (1)</p> <p><b>allow</b> H<sub>4</sub>C<sub>2</sub>/CH<sub>2</sub>CH<sub>2</sub>/H<sub>2</sub>C<sub>2</sub>H<sub>2</sub>/H<sub>2</sub>CCH<sub>2</sub></p> <p>Any number in front of formula, can only score first mark eg 2CH<sub>2</sub> scores (1)</p> <p>2 and 4 must be clearly subscripted or smaller than C and H eg C2H4 or C<sup>2</sup>H<sup>4</sup> scores (1)</p>
<b>Total</b>			<b>3</b>	



Question		Expected Answers	Marks	Rationale
6	a	<div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> <p>Bubbles form around an electrode.</p> <p>The bulb lights up.</p> </div> <div style="width: 35%;"> <input type="checkbox"/>  <input type="checkbox"/>  <input checked="" type="checkbox"/>  <input checked="" type="checkbox"/>  <input type="checkbox"/> </div> </div>	2	If more than 2 boxes are ticked, deduct one mark for each additional tick
	b	ionic (1) ions (1) positive (1)	3	
	c	lead (1)	1	<b>Allow</b> led Allow correct symbol Pb Do not allow PB
<b>Total</b>			<b>6</b>	

Question			Expected Answers	Marks	Rationale
7	a	i	sulfuric (acid)/sulphuric (acid) (1)	1	<b>accept</b> phonetic spelling
		ii	magnesium carbonate (1) magnesium oxide (1)	2	If more than two compounds are ringed, deduct (1) for each additional incorrect compound.  Allow other indications of choice eg <u>underlining</u>
	b		<p style="text-align: right;"> <input type="checkbox"/>  <input type="checkbox"/>  <input checked="" type="checkbox"/>  <input type="checkbox"/> </p> <p>use acid that is more dilute</p>	1	If more than 1 box is ticked, 0 marks
<b>Total</b>				<b>4</b>	



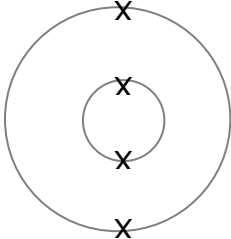
Question		Expected Answers	Marks	Rationale																		
8	a	<p>indicator paper</p> <div style="display: flex; flex-direction: column; align-items: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> </div>	1	If more than 1 box is ticked, 0 marks																		
	b	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #cccccc;"> <th>chemical</th> <th>acidic ...</th> <th>pH</th> </tr> </thead> <tbody> <tr style="background-color: #cccccc;"> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td>1-2</td> </tr> <tr> <td></td> <td>neutral</td> <td></td> </tr> <tr style="background-color: #cccccc;"> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td>8-10</td> </tr> </tbody> </table>	chemical	acidic ...	pH						1-2		neutral							8-10	3	
chemical	acidic ...	pH																				
		1-2																				
	neutral																					
		8-10																				
<b>Total</b>			<b>4</b>																			


Question		Expected Answers	Marks	Rationale	
9	a	<div style="border: 1px solid black; padding: 5px; display: inline-block; margin-bottom: 10px;">hydrochloric acid (1)</div> <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-bottom: 10px;">burette (1)</div> <div style="border: 1px solid black; padding: 5px; display: inline-block;">flask (1)</div>	3		
	b	neutralisation (1)	1	<p>If more than one answer is ringed, deduct (1) for each additional incorrect response.</p> <p>Allow other indications of choice eg <u>underlining</u></p>	
	c	i	40 (1)	1	
		ii	<p>She spilled some chemicals.</p> <div style="display: flex; flex-direction: column; align-items: flex-end; gap: 10px;"> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div>	1	If more than 1 box is ticked, 0 marks
<b>Total</b>			<b>6</b>		



Question			Expected Answers	Marks	Rationale
2	a	i	<p>Diagram for question 2a(i):</p> <ul style="list-style-type: none"> <li>A box labeled "solid iodine" has a line connecting to a box labeled "dark grey".</li> <li>A box labeled "iodine gas" has a line connecting to a box labeled "purple".</li> </ul> <p>There are also four empty boxes in the "Expected Answers" column: one below "dark grey", one below "solid iodine", one below "purple", and one below the empty box below "purple".</p>	2	<p>(1) mark for each correct line.</p> <p>If more than 2 lines are drawn, deduct (1) for each additional incorrect line.</p>
		ii	<p>Diagram for question 2a(ii):</p> <ul style="list-style-type: none"> <li>A box labeled "solid iodine" has a line connecting to a box labeled "I<sub>2</sub>(s)".</li> <li>A box labeled "iodine gas" has a line connecting to a box labeled "I<sub>2</sub>(g)".</li> </ul> <p>There are also four empty boxes in the "Expected Answers" column: one above "I<sub>2</sub>(s)", one above "I<sub>2</sub>(g)", one below "solid iodine", and one below "iodine gas".</p>	2	<p>(1) mark for each correct line.</p> <p>If more than 2 lines are drawn, deduct (1) for each additional incorrect line.</p>

Question		Expected Answers	Marks	Rationale
2	b	<p>Iodine is in Group 7. <input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p>All Group 7 elements kill bacteria. <input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p>	1	<p>Both must be correct for (1) mark</p> <p>If more than two ticks, 0 marks</p>
<b>Total</b>			<b>5</b>	

Question		Expected Answers	Marks	Rationale
3	a	<div style="text-align: right;"> <input type="checkbox"/>  <input type="checkbox"/>  ... light of different colours. <input checked="" type="checkbox"/>  <input type="checkbox"/>  ... very hot and so emit light. <input checked="" type="checkbox"/> </div>	2	<p>If more than two ticks are given, deduct (1) mark for each additional incorrect tick.</p> <p><b>Allow</b> other indications of choice.</p>
	b	<p>protons and neutrons named in either order (1)</p> <p>correct numbers of protons and neutrons: 4 protons, 5 neutrons (1)</p> <p>4 electrons in arrangement 2,2 (1)</p>	3	<p>Second mark cannot be scored if protons and neutrons not named. 4 neutrons and 5 protons scores first mark only (1)</p> <p><b>Allow</b> phonetic spelling of protons and neutrons.</p> <p>eg two electrons anywhere in <b>each</b> 'ring'.</p> <div style="text-align: center;">  </div> <p><b>Allow</b> other symbols for electrons eg e, - or o</p>
<b>Total</b>			<b>5</b>	

Question		Expected Answers	Marks	Rationale
4	a	 <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	1	If more than 1 box is ticked, 0 marks
	b	C and H only in the formula (1) Fully correct formula: C <sub>2</sub> H <sub>4</sub> (2)	2	C and H must be capitals eg CH <sub>4</sub> scores (0) C <sub>2</sub> h <sub>4</sub> scores (1) <b>allow</b> H <sub>4</sub> C <sub>2</sub> / CH <sub>2</sub> CH <sub>2</sub> / H <sub>2</sub> C <sub>2</sub> H <sub>2</sub> / H <sub>2</sub> CCH <sub>2</sub> Any number in front of formula, can only score first mark eg 2CH <sub>2</sub> scores (1) 2 and 4 must be clearly subscripted or smaller than C and H eg C2H4 or C <sup>2</sup> H <sup>4</sup> scores (1)
<b>Total</b>			<b>3</b>	

Question		Expected Answers	Marks	Rationale
5	a	<p style="text-align: right;"><input type="checkbox"/></p> <p>Potassium iodide is an ionic compound. <input checked="" type="checkbox"/></p> <p>Ions in the liquid are free to move. <input checked="" type="checkbox"/></p> <p style="text-align: right;"><input type="checkbox"/></p> <p style="text-align: right;"><input type="checkbox"/></p> <p style="text-align: right;"><input type="checkbox"/></p>	2	<p>If more than two ticks are given, deduct (1) mark for each additional incorrect tick.</p> <p><b>Allow</b> other indications of choice.</p>
	b	lead (1)	1	<p><b>Allow</b> led</p> <p><b>Allow</b> correct symbol Pb <b>Do not allow</b> PB</p>
	c	e <sup>-</sup> /e	1	<b>Do not allow</b> word 'electron'
<b>Total</b>			<b>4</b>	



Question		Expected Answers	Marks	Rationale
6	a	C (1)	1	<b>Allow</b> lower case More than one letter scores 0
	b	A (1)	1	As above
	c	D (1)	1	As above
	d	<p style="text-align: right;"> <input type="checkbox"/>  <input checked="" type="checkbox"/>  <input checked="" type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/> </p> <p>Electrons are shared between atoms.</p> <p>The nucleus of each bonded atom ...</p>	2	<p>If more than two ticks are given, deduct (1) mark for each additional incorrect tick.</p> <p><b>Allow</b> other indications of choice.</p>
	e	MgF <sub>2</sub> (1)	1	<p>Must have capital M and lower case g in Mg and full size F with subscripted 2.  <b>Do not allow</b> MGF<sub>2</sub>/Mg2F/MgF<sup>2</sup>/Mg<sub>2</sub>F /F<sub>2</sub>Mg</p> <p>Top of the number 2 after F should not be above half the height of the F, <b>Do not allow</b> MgF2.</p> <p>Do not allow if any number is in front of formula eg 2MgF<sub>2</sub> scores 0</p>
<b>Total</b>			<b>6</b>	

Question			Expected Answers	Marks	Rationale
7	a	i	sulfuric (acid)/sulphuric (acid) (1)	1	<b>accept</b> phonetic spelling
		ii	magnesium carbonate (1) magnesium oxide (1)	2	If more than two compounds are ringed, deduct (1) for each additional incorrect compound.  <b>Allow</b> other indications of choice eg <u>underlining</u>
	b	i	<div style="text-align: right;"> <input type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/>  <input checked="" type="checkbox"/> </div> All the acid is used up.	1	If more than 1 box is ticked, 0 marks
		ii	<div style="text-align: right;"> <input type="checkbox"/>  <input type="checkbox"/>  <input checked="" type="checkbox"/>  <input type="checkbox"/> </div> to get more magnesium sulfate ...	1	If more than 1 box is ticked, 0 marks

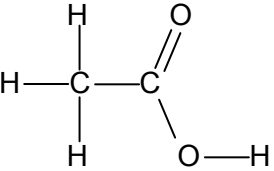
Question			Expected Answers	Marks	Rationale															
7	b	iii	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 20%; text-align: center;">true</th> <th style="width: 20%; text-align: center;">false</th> </tr> </thead> <tbody> <tr> <td>... largest crystals.</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>...as he heats it.</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>... faster the crystals form.</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>... solid salt evaporate.</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> </tbody> </table>		true	false	... largest crystals.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	...as he heats it.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	... faster the crystals form.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	... solid salt evaporate.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	2	All 4 correct = 2 2 or 3 correct = 1 1 correct = 0
	true	false																		
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	<input type="checkbox"/>																			
	<input type="checkbox"/>																			
use acid that is more dilute	<input checked="" type="checkbox"/>																			
	<input type="checkbox"/>																			
<b>Total</b>				<b>8</b>																

Question			Expected Answers	Marks	Rationale																		
8	a	i	A (1)	1	If more than one choice ringed, 0 marks																		
		ii	B and C (1)	1	<b>both</b> needed for the mark If more than two letters ringed, 0 marks																		
	b		K <sup>+</sup> ringed <u>and</u> both K <sub>2</sub> <sup>2+</sup> and K <sup>2+</sup> unringed (1)  SO <sub>4</sub> <sup>2-</sup> ringed <u>and</u> both S <sup>2-</sup> and O <sup>2-</sup> unringed (1)	2																			
	c		<table style="width: 100%; border: none;"> <thead> <tr> <th style="width: 80%;"></th> <th style="width: 10%; text-align: center;">true</th> <th style="width: 10%; text-align: center;">false</th> </tr> </thead> <tbody> <tr> <td>... produces a precipitate.</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>... is a neutralisation reaction.</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>... produces OH<sup>-</sup> ions.</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>An equation for the reaction is ...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>Hydrogen gas is given off.</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> </tbody> </table>		true	false	... produces a precipitate.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	... is a neutralisation reaction.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	... produces OH <sup>-</sup> ions.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	An equation for the reaction is ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Hydrogen gas is given off.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	3	All 5 correct = 3 4 correct = 2 2 or 3 correct = 1 1 correct = 0
	true	false																					
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An equation for the reaction is ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>																					
Hydrogen gas is given off.	<input type="checkbox"/>	<input checked="" type="checkbox"/>																					
<b>Total</b>				<b>7</b>																			

## A323/01 Unit 3 Ideas in Context plus C7 Foundation Tier

Question			Expected Answers	Marks	Rationale
1	a	i	<b>any two from:</b> corn; maize; sugar (beet);	1	both required for the mark
		ii	Austria (1)	1	
	b		<b>any two from:</b> produces less carbon dioxide; requires less energy to produce; transport produces less pollution; it is sustainable; it is renewable; it is biodegradable; it is less toxic than fossil fuels; it produces less carbon monoxide/particulate carbon;	2	
	c	i	annual wheat surplus of 3.5 million tons would produce enough bioethanol for only about 5%/car engines will have to be modified to use more than 5% bioethanol/insufficient land space to produce the crop/use more wheat than surplus/reduces land space for food (1)	1	
		ii	20 hectares of wheat (1)	1	
	d	i	as more crops are grown for fuel less will be grown for food, causing a shortage (1)	1	
		ii	fossil fuel will be used to produce the fertilizer (1) over use of fertilizer will cause water pollution (1)	2	

Question			Expected Answers	Marks	Rationale
1	e	i	<b>any two from:</b> (energy used in/environmental impact of:) growing fuel crop/harvesting fuel crop/fuel crop is renewable; fermentation/processing into ethanol; decrease in soil fertility; effect on water supply; use of fertilizers;	2	<b>ignore</b> renewable unqualified
	e	ii	petrol/crude oil is finite/not renewable (1) bioethanol is made from crops, which we can grow more of (1)	2	<b>allow</b> description of carbon cycle for bioethanol <b>allow</b> bioethanol is renewable
			<b>Total</b>	<b>13</b>	

Question			Expected Answers	Marks	Rationale
2	a		circle around COOH group (1)	1	
	b	i	methanoic acid + calcium carbonate (1) → calcium methanoate + carbon dioxide + water (1)	2	
		ii	calcium methanoate is soluble (1)	1	
		iii	methanoic acid is a weak acid (1) hydrochloric is a strong acid (1) hydrochloric acid will damage the kettle/methanoic acid will remove limescale without damaging the kettle (1) QWC - at least ten words with no more than one spelling error (1)	4	
	c		 structure of CH <sub>3</sub> correct (1) structure of COOH correct (1)	2	
			<b>Total</b>	<b>10</b>	

Question		Expected Answers	Marks	Rationale
3	a	as an energy store (1)	1	
	b	i glycerol (1) + fatty acids (1)	2	either order <b>allow</b> long chain carboxylic acids = fatty acids
		ii reaction is reversible/reaction can go either way/reaction can go forwards and backwards (1) reaction reaches an equilibrium/all reactants and products are present in the reaction mixture (at equilibrium) (1)	2	<b>allow</b> it is a (dynamic) equilibrium <b>allow</b> forward and reverse rates are the same
	c	as flavouring/to improve taste (1) to give the required smell/to improve smell (1)	2	
<b>Total</b>			<b>7</b>	

Question		Expected Answers	Marks	Rationale
4	a	time from injection of sample (1) until chemical leaves column/to appearance of peak/is detected (1)	2	time it takes to go through stationary phase is <b>2</b> marks
	b	i ethane <u>propene</u> butane	2	any order all correct = 2 marks 2 correct 1= 1 mark <b>reject</b> propane
		ii <u>propene</u> (1)	1	<b>reject</b> propane
		iii <u>propene</u> (1)	1	<b>reject</b> propane
	c	i <b>any two from:</b> they have unreactive C-C bonds; they have unreactive C-H bonds; they only have single bonds/they do not have double bonds/they are saturated;	2	<b>allow</b> they have unreactive bonds for 1 mark only <b>ignore</b> all their bonds are strong/C-C bonds are stronger than C=C bonds
		ii bond making releases energy and bond breaking takes in energy (1) more energy is released than taken in (1)	2	<b>allow</b> as alternative words exothermic = releases energy, endothermic = takes in energy marks can be scored from an annotated energy level diagram
<b>Total</b>			<b>10</b>	

Question		Expected Answers	Marks	Rationale						
5	a	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>D</td> <td>A</td> <td>C</td> <td>F</td> <td>B</td> <td>E</td> </tr> </table>	D	A	C	F	B	E	3	all 5 in correct order = 3 marks any 4 in correct order = 2 marks any 3 in correct order = 1 mark
D	A	C	F	B	E					
	b	i	measuring cylinder (1)	1	<b>allow</b> pipette					
		ii	burette (1)	1						
	c	i	use of 24, 16 and 1 in calculation but processed incorrectly (1)  58 (1)	2	<b>allow</b> first mark for calculations otherwise correct but missing out a step eg 2 x 1 or 2 x 16 <b>do not allow</b> first mark for totally incorrect calculation eg 24 x 16 x 1 <b>allow</b> 2 marks for correct answer without working					
		ii	0.75 (1)	1	<b>allow</b> 0.747/0.746 <b>allow</b> ecf from 5(c)(i)					
<b>Total</b>			<b>8</b>							

Question		Expected Answers	Marks	Rationale	
6	a	i	a chemical made in large quantities (1)	1	
		ii	it is made from ethene which is made from crude oil (1) crude oil/ethene is finite/crude oil/ethene will run out (1)	2	
	b	i	the calcium chloride must be dumped/the calcium chloride must be disposed of (1)	1	<b>must</b> imply that calcium chloride has to be disposed of – <b>not</b> just a waste product.
		ii	larger surface area (1) gives more contact with reactants (1)	2	
	c		to protect people/to protect the environment/health and safety (1)	1	<b>allow</b> make safe <b>allow</b> harming others by misuse
<b>Total</b>			<b>7</b>		

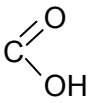
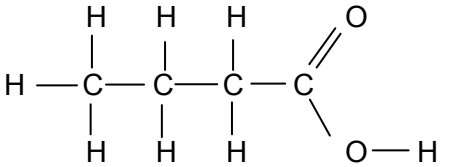
<b>Paper Total</b>			<b>55</b>	
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## A323/02 Unit 3 Ideas in Context plus C7 Higher Tier

Question		Expected Answers	Marks	Rationale
1	a	<p>pollution is caused/carbon dioxide is released by the production process (1) it gives 70% of the mileage of petrol (1)</p>	2	<p><b>allow</b> as bioethanol is made = production process</p> <p><b>ignore</b> releases 34% less energy unless qualified <b>allow</b> eg it gives less miles (per gallon) than petrol</p>
	b	<p>this would use wheat/land that is now used for food/cause decline in soil fertility/decrease water supply/quality/increase fertiliser use (1)</p> <p>food prices would increase/there would be a food shortage/we would have to import more food (1) car engines would need to be modified (1)</p>	2	<p>Any two</p> <p><b>ignore</b> uses a lot of land/would use too much land <b>ignore</b> references to decreasing habitats for animals</p> <p><b>ignore</b> would have to import bioethanol</p>
	c	<p>these countries struggle to feed everyone/ need all their crops for food (1) making bioethanol will cause a food shortage/cause famine (1)</p>	2	<p><b>ignore</b> references to land quality/rainfall/technology/cars/<b>ignore</b> copied statement 'The amount of grain .... an African village'.</p>
	d	<p>RFM octane 114 <b>and</b> RFM carbon dioxide 44 (1) mass of carbon dioxide = <math>(8 \times 44) / 114</math> = 3.1 g (1)</p> <p>percentage = <math>100 \times (3.1 - 1.9) / 1.9 = 63</math> <b>or</b> percentage = <math>[(3.1 / 1.9) \times 100] - 100 = 63</math> (1)</p>	3	<p><b>allow</b> 352 for 44 (ie <math>8 \times 44</math>)</p> <p><b>allow</b> 2 marks for correct mass of carbon dioxide alone <b>allow</b> 3.08 g/3.09 g/3.087 g/3.088 g</p> <p><b>allow</b> any answer between 62.0 and 63.2 but <b>do not allow</b> an answer that is derived from incorrect working <b>allow</b> ecf from mass answer for % from 55 to 65 only <b>do not</b> give mark for 60% unless <b>working</b> gives 3.04 for mass</p>

Question			Expected Answers	Marks	Rationale
1	e	i	(energy used in/environmental impact of:) growing fuel crop/harvesting fuel crop/fuel crop is renewable; fermentation/processing into ethanol; decrease in soil fertility; effect on water supply; use of fertilisers;	2	Any two  <b>ignore</b> renewable unqualified
		ii	petrol/crude oil is finite/not renewable (1) bioethanol is made from crops, which we can grow more of (1)	2	<b>allow</b> description of carbon cycle for bioethanol <b>allow</b> bioethanol is renewable
			<b>Total</b>	<b>13</b>	

Question		Expected Answers	Marks	Rationale
2	a	COOH	1	allow CO <sub>2</sub> H  allow 
	b	i	2	one mark for all formulae correct, one mark for balance balance mark can only be scored if formulae correct <b>allow</b> molecular formulae subscript numbers must be clearly subscript or no marks
		ii	1	calcium methanoate is soluble (1)
		iii	4	a strong acid is completely ionised (1) a weak acid is only partly ionised (1) the weak acid has dynamic equilibrium/in a weak acid the equilibrium is far to the left/in a dynamic equilibrium the reaction does not go to completion (1)  QWC - at least ten words with no more than one spelling error per ten words (1)  <b>only give the third marking point</b> if there is no suggestion that the strong acid also has a (dynamic) equilibrium <b>ignore</b> reaction goes in both directions  QWC mark can be given if there has been a genuine attempt at an answer even if the chemistry has scored no marks
	c		1	<b>allow</b> CH <sub>3</sub> for methyl group/CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> COOH <b>allow</b> COOH for carboxyl group/OH instead of O-H <b>allow</b> correct structure with a circle around each atom <b>reject</b> molecule drawings using shaded circles to show atoms
<b>Total</b>			<b>9</b>	

Question			Expected Answers	Marks	Rationale
3	a	i	glycerol (1) + fatty acids (1)	2	either order <b>allow</b> long chain carboxylic acids = fatty acids
		ii	reaction is reversible/reaction can go either way/reaction can go forwards and backwards (1)  reaction reaches an equilibrium/all reactants and products are present in the reaction mixture (at equilibrium) (1)	2	<b>allow</b> it is a (dynamic) equilibrium <b>allow</b> forward and reverse rates are the same
	b		purification: product is shaken with reagent in a tap/separating funnel (1) impurities dissolve in reagent (which can be run off) (1)  drying: <u>solid</u> drying agent is added to product (1) the drying agent absorbs water from the product (1)	4	<b>allow</b> named reagent eg distilled water <b>ignore</b> references to neutralisation  <b>allow</b> named solid drying agent eg calcium chloride/sodium sulfate, <b>do not allow</b> calcium carbonate!
			<b>Total</b>	<b>8</b>	

Question			Expected Answers	Marks	Rationale
4	a	i	<u>propene</u>	1	<b>do not allow propane!</b>
		ii	area under the peak is largest/area under peak shows concentration	1	<b>allow</b> highest/widest/longest <b>ignore</b> references to retention time
	b		the mobile phase carries the sample (1)  components are differently attracted to the stationary and mobile phases (1)  the components that are more strongly attracted to the stationary phase move more slowly/ora (1)  the amount of each component in the stationary phase and in the mobile phase is determined by a dynamic equilibrium (1)	4	accept answers that are based on ideas of different concentrations/different time spent in each phase as alternative to attraction  again accept answers that are based on ideas of different concentrations/different time spent in each phase as alternative to attraction
	c	i	they have unreactive C-C bonds (1) they have unreactive C-H bonds (1) they only have single bonds/they do not have double bonds/they are saturated (1)	2	Any two <b>allow</b> they have unreactive bonds = 1 mark only <b>ignore</b> all their bonds are strong/C-C bonds are stronger than C=C bonds
		ii	bond making releases energy and bond breaking takes in energy (1) more energy is released than taken in (1)	2	<b>allow</b> as alternative words exothermic = releases energy , endothermic = takes in energy marks can be scored from an annotated energy level diagram
			<b>Total</b>	<b>10</b>	

Question			Expected Answers	Marks	Rationale
5	a	i	use of 24, 16 and 1 in calculation but processed incorrectly (1)  58 (1)	2	<b>allow</b> first mark for calculations otherwise correct but missing out a step eg 2x1 or 2x16 <b>do not allow</b> first mark for totally incorrect calculation eg 24x16x1  <b>allow</b> 2 marks for correct answer without working
		ii	$(40 \times 23.5/1000 =) 0.94 \text{ g}$	1	
		iii	$58 \times 0.94/73 (1)$  $= 0.75 \text{ g} (1)$	2	<b>allow</b> 2 marks for correct answer without working <b>allow</b> 0.747 g/0.746 g <b>but not</b> 0.7 g or 0.8 g <b>allow</b> ecf from (i) and (ii) only if working shown
	b		there is only a small degree of uncertainty (1)  all of the titration values are close to average/23.5/all titration values are within 0.1 of average/23.5/titration values have a small range/range of 0.2 (1)	2	<b>ignore</b> references to reliability (for first marking point)  <b>allow</b> titration results are reliable
			<b>Total</b>	<b>7</b>	

Question			Expected Answers	Marks	Rationale
6	a	i	both methods are not sustainable (1)  because feedstock/hydrocarbon/ethene obtained from crude oil which has a finite supply (1)	2	
		ii	old method is less sustainable/ora (1)  old method has a by-product/old method has worse atom economy unless uses can be found for the by-product(1)	2	<b>allow</b> named by-product: calcium chloride
	b		catalyst provides an alternative route for the reaction (1)  with a lower activation energy (1)	2	<b>allow</b> reactants stick to catalyst surface (1) increases concentration of reactants (1) <b>allow</b> interaction with catalyst breaks/weakens bonds of reactants (1) allowing products to be formed faster (1) <b>ignore</b> references to collision rate or increased surface area
	c		$2\text{C}_2\text{H}_4 + \text{O}_2 \rightarrow 2(\text{CH}_2)_2\text{O}$	2	one mark for correct formulae, one mark for balance <b>allow</b> $\text{C}_2\text{H}_4\text{O}$ for epoxyethane <b>allow</b> displayed formulae if correct  balance mark can only be scored if formulae correct subscript numbers must be clearly subscript or no marks
			<b>Total</b>	<b>8</b>	
			<b>Paper Total</b>	<b>55</b>	

# Grade Thresholds

General Certificate of Secondary Education  
Chemistry A (Specification Code J634)  
June 2009 Examination Series

## Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
A321/01	Raw	42	N/A	N/A	N/A	29	24	20	16	12	0
	UMS	34	N/A	N/A	N/A	30	25	20	15	10	0
A321/02	Raw	42	33	28	23	18	14	12	N/A	N/A	0
	UMS	50	45	40	35	30	25	23	N/A	N/A	0
A322/01	Raw	42	N/A	N/A	N/A	27	23	19	15	11	0
	UMS	34	N/A	N/A	N/A	30	25	20	15	10	0
A322/02	Raw	42	30	24	19	15	10	7	N/A	N/A	0
	UMS	50	45	40	35	30	25	23	N/A	N/A	0
A323/01	Raw	55	N/A	N/A	N/A	21	17	13	10	7	0
	UMS	100	N/A	N/A	N/A	60	50	40	30	20	0
A323/02	Raw	55	26	19	14	10	7	5	N/A	N/A	0
	UMS	100	90	80	70	60	50	45	N/A	N/A	0
A329	Raw	40	33	30	26	23	19	15	12	9	0
	UMS	100	90	80	70	60	50	40	30	20	0
A330	Raw	40	33	31	28	25	21	18	15	12	0
	UMS	100	90	80	70	60	50	40	30	20	0

A329/A330 (Coursework) - The grade thresholds have been determined on the basis of the work that was presented for award in June 2009. The threshold marks will not necessarily be the same in subsequent awards.

## Specification Aggregation Results

Overall threshold marks in UMS (ie after conversion of raw marks to uniform marks)

	Maximum Mark	A*	A	B	C	D	E	F	G	U
<b>J634</b>	300	270	240	210	180	150	120	90	60	0

The cumulative percentage of candidates awarded each grade was as follows:

	A*	A	B	C	D	E	F	G	U	Total No. of Cands
<b>J634</b>	20.3	47.6	76.0	93.6	98.9	99.8	100.0	100.0	100.0	15121

**15456 candidates were entered for aggregation this series**

For a description of how UMS marks are calculated see:

[http://www.ocr.org.uk/learners/ums\\_results.html](http://www.ocr.org.uk/learners/ums_results.html)

Statistics are correct at the time of publication.



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