



**GCSE**

**Chemistry A  
Twenty First Century Science**

General Certificate of Secondary Education **J634**

**Mark Schemes for the Units**

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**June 2008**

**J634/MS/R/08**

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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.

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# Guidance for Examiners

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. Each separate marking point is indicated by a (1) at the end of that marking point.
4. Abbreviations, annotations and conventions used in the detailed Mark Scheme:

ORA = or reverse argument

NOT = point that is not given credit

AW/owtte = alternative wording/or words to that effect: allow any expression that is clearly equivalent

/ = Alternative and acceptable answers for the same marking point

point = point must be present to gain the mark

(description) = description which need not be present to gain the mark

E.g. mark scheme shows 'work done in lifting / (change in) gravitational potential energy'  
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. The list principle: if a list of responses greater than the number requested is given, you 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, i.e. 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.
7. Marking method for tick boxes:  
If there is a set of boxes, some of which should be ticked and others left empty, then you need to judge the entire set of boxes.

E.g. 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). For a two-mark question, the rationale would be:

All boxes are indicated scores 0 marks.

All boxes blank scores 0 marks.

All four boxes correct scores 2 marks.

Three boxes correct scores 1 mark.

Two boxes correct scores 1 mark.

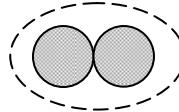
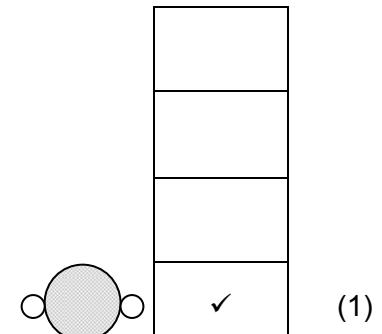
Edinburgh			✓		✓	✓	✓	✓	✓	
Manchester	✓	✗	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	✗		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

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

Question		Expected Answers	Marks	Rationale																
1	a	<p>each bus carries many people</p> <p>many people travelling to work in cars make more total pollutants</p>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	1 both required																
	b	<table border="1"> <thead> <tr> <th>pollutant</th> <th colspan="3">problem caused</th> </tr> </thead> <tbody> <tr> <td>sulfur dioxide</td> <td>(✓)</td> <td>(✓)</td> <td></td> </tr> <tr> <td>nitrogen oxides</td> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td>carbon</td> <td></td> <td>✓</td> <td>✓</td> </tr> </tbody> </table>	pollutant	problem caused			sulfur dioxide	(✓)	(✓)		nitrogen oxides	✓	✓		carbon		✓	✓	2 (1) (1)	both ticks per correct line (1) ignore tick in third box on first line (sulfur dioxide)
pollutant	problem caused																			
sulfur dioxide	(✓)	(✓)																		
nitrogen oxides	✓	✓																		
carbon		✓	✓																	
	c	carbon monoxide	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1 (1)																

Question			Expected Answers	Marks	Rationale
	d	i	Joe	1	more than one choice ringed = 0 marks
		ii	Eve and Liz	1	both required more than two choices ringed = 0 marks
Total			6		

Question		Expected Answers		Marks	Rationale										
2	a	<table border="1"> <thead> <tr> <th>name of gas</th> <th>percentage</th> </tr> </thead> <tbody> <tr> <td>oxygen</td> <td>(21%)</td> </tr> <tr> <td>nitrogen</td> <td>(78%)</td> </tr> <tr> <td>argon</td> <td>(&gt;1%)</td> </tr> <tr> <td>(carbon dioxide)</td> <td>(0.03%)</td> </tr> </tbody> </table>	name of gas	percentage	oxygen	(21%)	nitrogen	(78%)	argon	(>1%)	(carbon dioxide)	(0.03%)	<div style="display: flex; align-items: center; justify-content: space-between;"> <span>(1)</span> <span>(1)</span> </div>	2	oxygen and nitrogen in the <b>right order</b> (1) argon (1)
name of gas	percentage														
oxygen	(21%)														
nitrogen	(78%)														
argon	(>1%)														
(carbon dioxide)	(0.03%)														
	b	i	<p>CO<sub>2</sub> has increased rapidly over the last 200 years before 1800, there were small changes in CO<sub>2</sub></p> <div style="display: flex; align-items: center; justify-content: space-between;"> <div style="border: 1px solid black; width: 10px; height: 10px; margin-right: 10px;"></div> <div style="display: flex; align-items: center; gap: 10px;"> <span>(1)</span> <span>(1)</span> </div> </div>	2											
		ii	<p>there are many more motor vehicles in the world</p> <div style="display: flex; align-items: center; justify-content: space-between;"> <div style="border: 1px solid black; width: 10px; height: 10px; margin-right: 10px;"></div> <div style="display: flex; align-items: center; gap: 10px;"> <span>(1)</span> </div> </div>	1											

Question			Expected Answers		Marks	Rationale
2	c	i			1	one of the two oxygen molecules circled (1) <b>allow</b> both oxygen molecules circled <b>not</b> circle around one oxygen atom only <b>not</b> circle that includes other molecules
		ii			1	
	d		dissolving in rainwater  dissolving in the sea  plant photosynthesis		2	all three correct (2) two correct (1)
	e		carbon dioxide (1) water (1)		2	
			<b>Total</b>		11	

Question		Expected Answers	Marks	Rationale
3	a	i ramie	1	more than one choice ringed = 0 marks
		ii sisal	1	more than one choice ringed = 0 marks
		iii Hemp ropes do not absorb water as much It is easier to handle light ropes	2	
	b	i check reliability calculate a best estimate	2	
		ii 800 to 1500	1	both required in either order
		iii some of the rope was damp natural materials vary widely	2	

Question			Expected Answers	Marks	Rationale
3	c		strong and waterproof <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> (1)	1	
<b>Total</b>			<b>10</b>		

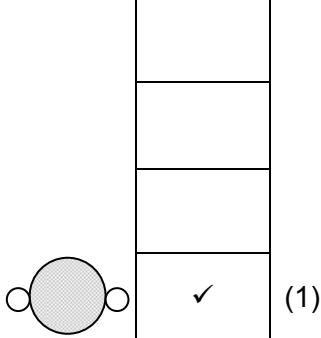
4	a	i	poly(ethene)	1	more than one choice ringed = 0 marks
		ii	bakelite and melamine	1	both required more than two choices ringed = 0 marks
	b		crude oil (1) hydrogen and carbon (1)	2	<b>both</b> hydrogen and carbon required, in either order
<b>Total</b>			<b>4</b>		

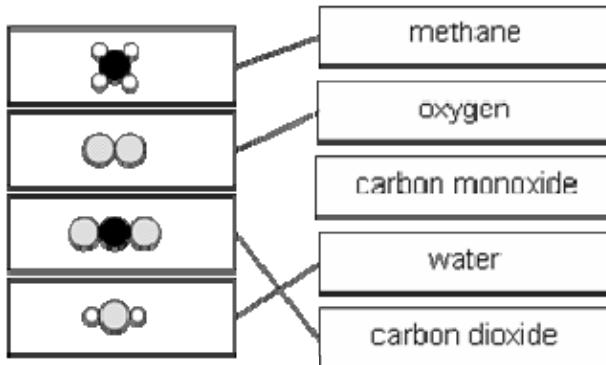
5			land produces more food per acre food is larger and free of pests <input checked="" type="checkbox"/> (1) <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/>	2	
<b>Total</b>			<b>2</b>		

Question		Expected Answers	Marks	Rationale
6	a	<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="border: 1px solid black; padding: 5px; text-align: center;">           colouring         </div> <div style="border: 1px solid black; padding: 5px; text-align: center;">           mix ingredients         </div> <div style="border: 1px solid black; padding: 5px; text-align: center;">           preservative         </div> <div style="border: 1px solid black; padding: 5px; text-align: center;">           look attractive         </div> <div style="border: 1px solid black; padding: 5px; text-align: center;">           emulsifier         </div> <div style="border: 1px solid black; padding: 5px; text-align: center;">           prevent microbes         </div> </div>	2	<p>all three choices correct (2) one or two choices correct (1)</p> <p>more than one line from the same box on the left to different boxes on the right is an incorrect choice</p>
	b	additives passed safety test <input checked="" type="checkbox"/> (1) approved for use in the UK <input checked="" type="checkbox"/> (1)	2	
<b>Total</b>		<b>4</b>		



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

Question			Expected Answers		Marks	Rationale
1	a	i	X marked on graph above 310 ppm		1	an indication of this position anywhere on the graph on or above the line of 310 ppm but not above 370 ppm = 1 mark
		ii	increase of about 100 ppm <input checked="" type="checkbox"/> (1) increase of about 30% <input checked="" type="checkbox"/> (1)		2	per correct tick (1)
	b	i			1	

Question	Expected Answers		Marks	Rationale
1	ii		3	<p>all correct (3)      three correct (2)      two or one correct (1)</p> <p>more than one line leaving a box on the left or approaching a box on the right loses that mark.</p>
		<b>Total</b>	7	

Question		Expected Answers		Marks	Rationale											
2	a	each bus carries many people  many people travelling to work in cars make more total pollutants	<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	1	both required											
	b	<table border="1"> <thead> <tr> <th>pollutant</th> <th colspan="2">problem caused</th> </tr> </thead> <tbody> <tr> <td>sulfur dioxide</td> <td>(✓)</td> <td>(✓)</td> </tr> <tr> <td>nitrogen oxides</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>carbon</td> <td></td> <td>✓</td> </tr> </tbody> </table> (1) (1)	pollutant	problem caused		sulfur dioxide	(✓)	(✓)	nitrogen oxides	✓	✓	carbon		✓	2	both ticks per correct line (1) ignore tick in third box on first line (sulfur dioxide)
pollutant	problem caused															
sulfur dioxide	(✓)	(✓)														
nitrogen oxides	✓	✓														
carbon		✓														
	c	incomplete combustion of the fuel	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1												

Question		Expected Answers				Marks	Rationale																				
2	d	<table border="1"> <tr> <td></td><td>true</td><td>false</td><td>N.E.E</td></tr> <tr> <td>Eve</td><td></td><td></td><td>✓</td></tr> <tr> <td>Joe</td><td></td><td>✓</td><td></td></tr> <tr> <td>Liz</td><td>✓</td><td></td><td></td></tr> <tr> <td>Sab</td><td></td><td></td><td>✓</td></tr> </table>					true	false	N.E.E	Eve			✓	Joe		✓		Liz	✓			Sab			✓	3	all correct (3) three correct (2) one or two correct (1)
	true	false	N.E.E																								
Eve			✓																								
Joe		✓																									
Liz	✓																										
Sab			✓																								
	e	<table border="1"> <tr> <td>true</td><td>false</td></tr> <tr> <td>✓</td><td></td></tr> <tr> <td></td><td>✓</td></tr> <tr> <td>✓</td><td></td></tr> <tr> <td></td><td>✓</td></tr> </table>				true	false	✓			✓	✓			✓	2	all correct (2) two or three correct (1)										
true	false																										
✓																											
	✓																										
✓																											
	✓																										
		<b>Total</b>				<b>9</b>																					

Question		Expected Answers	Marks	Rationale
3	a	i hemp and sisal	1	both required
		ii ranges for the values overlap <input type="checkbox"/> (1)	1	
		iii Hemp ropes do not absorb water as much It is easier to handle light ropes	2	
b	i	check reliability <input type="checkbox"/> (1) calculate a best estimate <input type="checkbox"/> (1)	2	
	ii	flax is a natural material <input type="checkbox"/> range is too wide for average <input type="checkbox"/>	1	both required

Question			Expected Answers		Marks	Rationale										
3	c		<table border="1"> <tr> <td>advantage</td> <td>disadvantage</td> </tr> <tr> <td></td> <td>✓</td> </tr> <tr> <td>✓</td> <td></td> </tr> <tr> <td></td> <td>✓</td> </tr> <tr> <td>✓</td> <td></td> </tr> </table>		advantage	disadvantage		✓	✓			✓	✓		2	all four correct (2) two or three correct (1)
advantage	disadvantage															
	✓															
✓																
	✓															
✓																
			<b>Total</b>		<b>9</b>											

4	a	i	poly(ethene)	1	more than one choice ringed = 0 marks	
		ii	bakelite and melamine	1	both required more than two choices ringed = 0 marks	
	b		<p>... is more flexible</p> <p>... has a lower tensile strength</p> <p>... polymer chains further apart</p>	2	all correct (2) two correct (1)	
			<b>Total</b>		<b>4</b>	

Question		Expected Answers			Marks	Rationale																		
5	a	wheat roots take up nutrients <input checked="" type="checkbox"/> (1)			2																			
		ripe wheat is harvested <input checked="" type="checkbox"/> (1)																						
	b	<table border="1"> <tr><td>true intensive</td><td>true organic</td><td>true both</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></td><td></td><td>✓</td></tr> <tr><td></td><td></td><td>✓</td></tr> </table>			true intensive	true organic	true both		✓		✓			✓					✓			✓	3	all correct (3) four correct (2) two or three correct (1)
true intensive	true organic	true both																						
	✓																							
✓																								
✓																								
		✓																						
		✓																						
		<b>Total</b>			<b>5</b>																			

6			<table border="1"> <tr><td>D</td></tr> <tr><td>D</td></tr> <tr><td>C</td></tr> <tr><td>B</td></tr> </table>	D	D	C	B		3	all correct (3) three correct (2) one or two correct (1)
D										
D										
C										
B										
			<b>Total</b>		<b>3</b>					

Question		Expected Answers	Marks	Rationale											
7	a	women with BMI of 25 are 5 times more likely to have type 2 diabetes than BMI 22  reducing your BMI may reduce your risk of getting type 2 diabetes	<div style="display: flex; align-items: center; justify-content: space-between;"> <div style="flex: 1;"> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">✓</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"> </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">✓</div> <div style="border: 1px solid black; padding: 2px;"> </div> </div> <div style="flex: 0.5; text-align: right;">(1)</div> </div> <div style="display: flex; align-items: center; justify-content: space-between; margin-top: 10px;"> <div style="flex: 1;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>true</td><td>false</td></tr> <tr><td>✓</td><td> </td></tr> <tr><td> </td><td>✓</td></tr> <tr><td>✓</td><td> </td></tr> <tr><td> </td><td>✓</td></tr> </table> </div> <div style="flex: 0.5; text-align: right;">(1)</div> </div>	true	false	✓			✓	✓			✓	2	
true	false														
✓															
	✓														
✓															
	✓														
	b														
			3	all correct (3) four correct (2) two or three correct (1)											
		<b>Total</b>	<b>5</b>												
		<b>Paper Total</b>	<b>42</b>												

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

Question		Expected Answers	Marks	Rationale
1	a	Na (1) K (1)	2	allow NA or na
	b	<div style="display: flex; align-items: center; justify-content: space-between;"> <div style="flex: 1;"> <div style="display: flex; gap: 10px;"> <div style="border: 1px solid black; padding: 2px;">2.1</div> <div style="border: 1px solid black; padding: 2px;">2.8.1</div> <div style="border: 1px solid black; padding: 2px;">2.8.2</div> <div style="border: 1px solid black; padding: 2px;">2.8.3</div> </div> <div style="display: flex; gap: 10px;"> <div style="border: 1px solid black; padding: 2px; width: 100px;">one electron in outer shell</div> <div style="border: 1px solid black; padding: 2px; width: 100px;">two electrons in outer shell</div> <div style="border: 1px solid black; padding: 2px; width: 100px;">three electrons in outer shell</div> </div> </div> </div>	3	<p>per correctly joined right hand box (1)</p> <p>ensure that <b>two</b> lines are connected to the top right box; if one line is missing then lose one mark.</p>
	c	<div style="display: flex; align-items: center; justify-content: space-between;"> <div style="flex: 1;"> <div style="display: flex; gap: 10px;"> <div style="border: 1px solid black; padding: 2px;">black/purple</div> <div style="border: 1px solid black; padding: 2px;">chlorine</div> <div style="border: 1px solid black; padding: 2px;">solid</div> </div> <div style="display: flex; gap: 10px;"> <div style="border: 1px solid black; padding: 2px;">green</div> <div style="border: 1px solid black; padding: 2px;">bromine</div> <div style="border: 1px solid black; padding: 2px;">liquid</div> </div> <div style="display: flex; gap: 10px;"> <div style="border: 1px solid black; padding: 2px;">orange/red</div> <div style="border: 1px solid black; padding: 2px;">iodine</div> <div style="border: 1px solid black; padding: 2px;">gas</div> </div> </div> </div>	3	<p>six correctly joined pairs (3)</p> <p>five or four correctly joined pairs (2)</p> <p>three or two correctly joined pairs (1)</p>
	ii	colourless	1	
		<b>Total</b>	<b>9</b>	

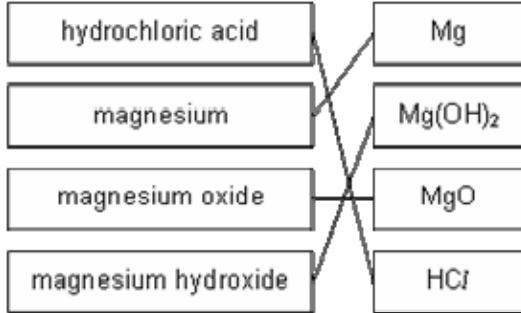
Question		Expected Answers	Marks	Rationale															
2	a	<table border="1"> <thead> <tr> <th></th> <th>elements</th> <th>compounds</th> </tr> </thead> <tbody> <tr> <td>oxygen</td> <td>✓</td> <td></td> </tr> <tr> <td>carbon dioxide</td> <td></td> <td>✓</td> </tr> <tr> <td>nitrogen</td> <td>✓</td> <td></td> </tr> <tr> <td>water vapour</td> <td></td> <td>✓</td> </tr> </tbody> </table>		elements	compounds	oxygen	✓		carbon dioxide		✓	nitrogen	✓		water vapour		✓	2	<p>four rows correct (2)</p> <p>three or two rows correct (1)</p> <p><b>allow</b> other clear identifying marks as well as ticks</p>
	elements	compounds																	
oxygen	✓																		
carbon dioxide		✓																	
nitrogen	✓																		
water vapour		✓																	
	b	oxygen      nitrogen      carbon dioxide	1	<p>all correct (1)</p> <p><b>allow</b> incorrect spellings</p> <p>Allow symbols e.g. O/ O<sub>2</sub> and N/N<sub>2</sub> and CO<sup>2</sup>/CO<sub>2</sub></p>															
<b>Total</b>		<b>3</b>																	

3	a	<table border="1"> <tr><td>F</td></tr> <tr><td>T</td></tr> <tr><td>F</td></tr> <tr><td>T</td></tr> <tr><td>T</td></tr> <tr><td>T</td></tr> </table>	F	T	F	T	T	T	3	<p>six correct (3)</p> <p>four or five correct (2)</p> <p>two or three correct (1)</p> <p>unmarked boxes are incorrect</p> <p>T or F must be clearly a T or an F rather than a combination or one overwritten on the other without clear decision. However, if the overwrite is clearly bolder, then <b>allow</b>.</p>
F										
T										
F										
T										
T										
T										
	b	bonds between particles are strong very large number of bonds	2	<p>if more than two boxes ticked then each extra box cancels a correct box</p>						
	c	Brenda (1) Daniel (1)	2	<p>either order</p>						
<b>Total</b>		<b>7</b>								

Question		Expected Answers	Marks	Rationale
4	a	oxygen (1) aluminium (1)	2	allow incorrect spellings  must be in this order  not percentages
	b	compound	1	
	c	sandstone	1	
	d	mantle	1	
<b>Total</b>		<b>5</b>		

5		Carol (1) Delia (1)	2	either order
		<b>Total</b>	<b>2</b>	

6		impurities might have side effects  dose is the same every time  impossible to test new medicines	<input checked="" type="checkbox"/> (1) <input checked="" type="checkbox"/> (1) <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	3  per correct line (1)  if more than three boxes ticked then each incorrect box cancels a correct box
		<b>Total</b>	<b>3</b>	

Question		Expected Answers	Marks	Rationale															
7	a	neutralisation		1															
	b			3 four correct lines (3) three or two correct lines (2) one correct line (1)															
	c	<table border="1"> <thead> <tr> <th colspan="3">reaction forms</th> </tr> <tr> <th>a salt</th> <th>hydrogen gas</th> <th>water</th> </tr> </thead> <tbody> <tr> <td>(✓)</td> <td></td> <td>(✓)</td> </tr> <tr> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td>✓</td> <td></td> <td>✓</td> </tr> </tbody> </table>		reaction forms			a salt	hydrogen gas	water	(✓)		(✓)	✓	✓		✓		✓	3 look at the question and all of the boxes as a whole. six correct boxes (3) five or four correct boxes (2) three or two correct boxes (1) one box correct scores zero
reaction forms																			
a salt	hydrogen gas	water																	
(✓)		(✓)																	
✓	✓																		
✓		✓																	
	d	sulfate (1) chloride (1)		2 <b>allow</b> sulphate, chloride/ chloride but no other incorrect spellings															
	e	B		1 Allow $H^+ + OH^-$															

Question		Expected Answers	Marks	Rationale
7	f	<div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;"> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">dissolving</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">crystallisation</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">evaporation</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">filtration</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">removes a solid from a mixture of a liquid and a solid</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">removes a liquid by heating</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">makes a solid appear in solution</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">turns a solid into a solution</div> </div> </div> <td>3</td> <td> <p>four correct lines (3)</p> <p>three or two correct lines (2)</p> <p>one correct line (1)</p> </td>	3	<p>four correct lines (3)</p> <p>three or two correct lines (2)</p> <p>one correct line (1)</p>
<b>Total</b>		<b>13</b>		
<b>Paper Total</b>		<b>42</b>		

# A322/02 Modules C4, C5, C6 Higher Tier

Question	Expected Answers		Marks	Rationale
1	Carol (1) Delia (1)		2	either order
	<b>Total</b>		<b>2</b>	

2	a	Brenda (1) Daniel (1)	2	either order
	b	MgCl <sub>2</sub>	1	
	c	Li <sub>3</sub> N	1	
	d	i	3	<p>all correct (3) five or four correct (2) three or two correct (1)</p> <p>unmarked boxes are incorrect</p> <p>T or F must be clearly a T or an F rather than a combination or one overwritten on the other without clear decision. If overwrite is clearly bolder then <b>allow</b>.</p>
		ii	2	<p>bonds between particles are strong</p> <p>very large number of bonds</p> <p style="text-align: center;"> <input checked="" type="checkbox"/> (1)  <input type="checkbox"/>  <input checked="" type="checkbox"/> (1)  <input type="checkbox"/> </p> <p>if more than two boxes ticked then each incorrect box cancels out a correct box</p>
			<b>Total</b>	<b>9</b>

Question		Expected Answers	Marks	Rationale
3	a	arrows 1 & 4 only  	1	
	b	arrow 1 only 	1	
	c	i iodine and bromine (1) potassium and lithium (1) bromine (1)	3	<b>allow any order</b> <b>allow any order</b>
	ii	potassium and bromine	1	<b>allow any order</b>

Question		Expected Answers			Marks	Rationale																												
3	d	<table border="1"> <tr> <td></td><td>covalent</td><td>ionic</td><td>metallic</td></tr> <tr> <td>A</td><td>✓</td><td></td><td></td></tr> <tr> <td>B</td><td></td><td></td><td>✓</td></tr> <tr> <td>C</td><td>✓</td><td></td><td></td></tr> <tr> <td>D</td><td>✓</td><td></td><td></td></tr> <tr> <td>E</td><td></td><td>✓</td><td></td></tr> <tr> <td>F</td><td></td><td></td><td>✓</td></tr> </table>				covalent	ionic	metallic	A	✓			B			✓	C	✓			D	✓			E		✓		F			✓	3	<p>six rows correct (3)        five or four correct (2)        three or two correct (1)        one correct (0)</p> <p>two ticks in one row = incorrect row</p>
	covalent	ionic	metallic																															
A	✓																																	
B			✓																															
C	✓																																	
D	✓																																	
E		✓																																
F			✓																															
<b>Total</b>			<b>9</b>																															
4		<p>B        A        C</p>			2	<p>three correct (2)        two or one correct (1)</p>																												
<b>Total</b>			<b>2</b>																															
5		<p>impurities might have side effects        dose is the same every time        impossible to test new medicines</p>			<input checked="" type="checkbox"/> (1) <input checked="" type="checkbox"/> (1) <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/>	<p>3 per correct line (1)        if more than three boxes ticked then each incorrect box cancels out a correct box</p>																												
<b>Total</b>			<b>3</b>																															

Question		Expected Answers	Marks	Rationale
6	a	Carl	1	
	b	i 1g	1	
		ii 54g	1	
<b>Total</b>		<b>3</b>		

7	a	<div style="border: 1px solid black; padding: 2px; display: inline-block;">         B   A   F   D   E       </div>	2	all correct in correct order (2) C omitted from boxes, ABDEF in any order (1) Any answer that includes C scores 0
	b	i B	1	
		ii $\text{Al}^{3+} + 3\text{e}^- \rightarrow \text{Al}$	1	
		iii arrow stays within the liquid and moves towards the right	1	If arrow goes to the left at any point then (0)
<b>Total</b>		<b>5</b>		

Question		Expected Answers	Marks	Rationale
8	a	Denise	1	
	b	<div style="display: flex; align-items: center; justify-content: space-around;"> <div style="border: 1px solid black; width: 150px; height: 40px; margin-right: 10px;"></div> <div style="border: 1px solid black; width: 150px; height: 40px; margin-right: 10px;"></div> </div> <div style="display: flex; align-items: center; justify-content: space-around;"> <div style="border: 1px solid black; width: 150px; height: 40px; margin-right: 10px;"></div> <div style="border: 1px solid black; width: 150px; height: 40px; margin-right: 10px;"></div> </div> <div style="display: flex; align-items: center; justify-content: space-around;"> <div style="border: 1px solid black; width: 150px; height: 40px; margin-right: 10px;"></div> <div style="border: 1px solid black; width: 150px; height: 40px; margin-right: 10px;"></div> </div> <div style="display: flex; align-items: center; justify-content: space-around;"> <div style="border: 1px solid black; width: 150px; height: 40px; margin-right: 10px;"></div> <div style="border: 1px solid black; width: 150px; height: 40px; margin-right: 10px;"></div> </div>	2	<p>for correct start point (1)</p> <p>for correct end point (1)</p> <p>more than one line (0)</p>
Total			3	

9	a		$\text{H}_2\text{SO}_4 + \underline{2} \text{ NaOH} \rightarrow \text{Na}_2\text{SO}_4 + \underline{2} \text{ H}_2\text{O}$	2	per correct answer (1)
	b		B	1	Allow $\text{H}^+ + \text{OH}^-$
	c		<div style="display: flex; align-items: center; justify-content: space-around;"> <div style="border: 1px solid black; width: 150px; height: 40px; margin-right: 10px;"></div> <div style="border: 1px solid black; width: 150px; height: 40px; margin-right: 10px;"></div> </div> <div style="display: flex; align-items: center; justify-content: space-around;"> <div style="border: 1px solid black; width: 150px; height: 40px; margin-right: 10px;"></div> <div style="border: 1px solid black; width: 150px; height: 40px; margin-right: 10px;"></div> </div> <div style="display: flex; align-items: center; justify-content: space-around;"> <div style="border: 1px solid black; width: 150px; height: 40px; margin-right: 10px;"></div> <div style="border: 1px solid black; width: 150px; height: 40px; margin-right: 10px;"></div> </div> <div style="display: flex; align-items: center; justify-content: space-around;"> <div style="border: 1px solid black; width: 150px; height: 40px; margin-right: 10px;"></div> <div style="border: 1px solid black; width: 150px; height: 40px; margin-right: 10px;"></div> </div>	3	<p>(1) for each fully correct line</p> <p>if more than three lines then each extra incorrect lines cancels out a correct line</p>
Total			6		
Paper Total			42		

# A323/01 Ideas in Context and Unit C7 - Foundation

Question			Expected Answers	Marks	Rationale
1	a	i	lithium sodium potassium / chlorine bromine iodine	2	all three names correct (2) two correct names (1) <b>allow</b> any order three correct symbols (1)
		ii	for alkali metals: they are soft metals they are very reactive metals/react with water They float (on water)  for halogens: they are gases they are very reactive non-metals	2	answer must match triad chosen in (i)
	b		any <b>three</b> from: it contained several major flaws Newlands assumed all elements had been discovered two elements placed in the same position elements with different properties in same group	3	maximum three
	c		example of three elements in positions 8 places apart (1) e.g. lithium, sodium and potassium  description of similarity (1) e.g. soft metal/very reactive metal	2	<b>allow</b> 1 mark for description of similarity without named elements. NOT any reference to atomic structures / particles

Question		Expected Answers	Marks	Rationale
1	d	<p>his predictions were accurate/proved to be correct (1)</p> <p>he left gaps in the correct places for these elements to fit into his Periodic Table / newly discovered elements fitted into the gaps he left (1)</p>	2	<p><b>ignore</b> references to predictions following a trend or based on properties of elements already discovered</p>
	e	<p>the same data can be interpreted in different ways / different parts of the data can be used (1)</p> <p>they were reluctant to say their ideas were wrong / reluctant to accept someone else's idea were right (1)</p>	2	<p><b>ignore</b> references to more data available now / better technology / hard to find a pattern that works / not all of the elements had been discovered</p> <p><b>not</b> some ordered by atomic number</p> <p><b>allow</b> new ideas are hard to accept</p>
		<b>Total</b>	<b>13</b>	

Question			Expected Answers	Marks	Rationale
2	a	i	keep warm / in range 20 – 40 °C (1) pH neutral / pH 7.0 +/- 1.0 (1)  QWC correct use of term temperature or pH or anaerobic (1)	3	<b>allow</b> anaerobic conditions / exclude air / exclude oxygen <b>not</b> heat
		ii	to increase ethanol concentration / to make pure ethanol	1	<b>allow</b> to separate ethanol from the reaction mixture
	b	i	ethane to ethene (1) ethene reacted with steam (to make ethanol) (1)  plus conditions used for either step i.e. by cracking / using heat / using catalyst for step 1 or by catalyst for step 2 (1)	3	  <b>allow</b> named catalysts: step 1 – zeolites step 2 – phosphoric acid
		ii	ethane/crude oil/natural gas/fossil fuel will one day run out (1)  fermentation uses plant material/source that can be grown (1)	2	<b>not</b> it will run out <b>allow</b> ethane is a non-renewable source / fermentation uses a renewable source without further details for one mark only <b>ignore</b> recycling / less pollution unqualified  <b>allow</b> fermentation uses less energy (1) because it is at a lower temperature (1) / ora

Question			Expected Answers		Marks	Rationale
2 c			<div style="display: flex; justify-content: space-around; align-items: center; gap: 10px;"><div style="border: 1px solid black; padding: 2px; text-align: center;">ethanol</div><div style="border: 1px solid black; padding: 2px; text-align: center;">oxygen</div><div style="border: 1px solid black; padding: 2px; text-align: center;">energy released</div><div style="border: 1px solid black; padding: 2px; text-align: center;">carbon dioxide</div><div style="border: 1px solid black; padding: 2px; text-align: center;">water</div></div>		3	<p>all correct (3) four correct (2) three or two correct (1)</p> <p><b>allow</b> ethanol and oxygen in either order (on same line)</p> <p><b>allow</b> carbon dioxide and water in either order (on same line)</p>
			<b>Total</b>		12	

Question			Expected Answers	Marks	Rationale
3	a		$C_2H_4O_2$ / $CH_3COOH$	1	allow symbols for elements in any order Numbers must be subscript.
	b	i	ethanoic acid + ethanol → (ethyl ethanoate) + water	1	allow ethanoic acid and ethanol in either order
		ii	catalyst / speeds up reaction	1	
		iii	any <b>two</b> from: in food in perfumes as solvents as plasticizers/make plastics flexible	2	any two allow examples of uses
	c	i	reaction is reversible / reaction goes both forwards and backwards / reaction goes both ways	1	allow equilibrium reaction ignore reference to rate of reaction / concentrations
		ii	molecules (1) water (1) reverse (1) constant (1)	4	
			<b>Total</b>	<b>10</b>	

Question			Expected Answers	Marks	Rationale
4	a	i	(D) C E A F (B)	3	all correct (3) or one mark per correct order: C before E (1) E before A (1) A before F (1)
		ii	to mix the contents	1	
	b	i	vinegar/ethanoic acid/acid	1	
		ii	more accurate	1	
		ii	conical flask / vinegar/ethanoic acid/acid	1	
		iv	safety	1	
	c		smaller range / closer together / less varied (1)  more reliable / more consistent (1)	2	<b>ignore</b> precise <b>ignore</b> reference to outliers / correlation  <b>not</b> more accurate <b>not</b> both more reliable <b>and</b> more accurate <b>allow</b> ora
			<b>Total</b>	<b>10</b>	

Question			Expected Answers	Marks	Rationale
5	a		it is made in large quantities	1	<b>allow</b> a lot is needed /manufactured more often
	b		rock is crushed (1) reacted with concentrated sulfuric acid (1) filtered (1) calcium sulfate dried and crushed into powder (1) concentrated acid is analysed (1)	5	<b>allow</b> the reaction
	c	i	Beth	1	
		ii	she identifies which <u>chemicals other than phosphoric acid/impurities</u> are present in the product	1	<b>allow</b> how pure the product is
	d		any <b>two</b> from: whether feedstock is renewable or not the atom economy disposal of the by-products/waste energy inputs / energy outputs environmental impact health and safety risks social and economic benefits	2	<b>any two</b>  <b>ignore</b> specific references e.g. greenhouse gases / carbon dioxide
			<b>Total</b>	10	

# A323/02 Ideas in Context and Unit C7 - Higher

Question		Expected Answers	Marks	Rationale
1	a	they have the same number of / one electron(s) (1)  in outer shell (1)	2	<b>allow</b> similar = same for number of electrons <b>ignore</b> need to lose one electron unless qualified <b>allow</b> missing one electron in outer shell = 1 <b>allow</b> incorrect number of electrons in outer shell = 1
	b	example of three elements in positions 8 places apart (1) e.g. lithium, sodium and potassium  description of similarity (1) e.g. soft (metal) / very reactive (metal)	2	examples <b>must</b> be from first 20 elements  <b>2<sup>nd</sup></b> mark depends on getting 1 <sup>st</sup> mark  <b>ignore</b> trend in group, e.g. reactivity increases / atomic number goes up in 8s <b>not</b> just gas for He Ne Ar but <b>allow</b> unreactive/inert gas
	c	his predictions were accurate/proved to be correct (1)  he left gaps in the correct places for these elements to fit into his Periodic Table / newly discovered elements fitted into the gaps he left (1)	2	<b>ignore</b> references to predictions following a trend or based on properties of elements already discovered
	d	the same data can be interpreted in different ways / different parts of the data can be used (1)  they were reluctant to say their ideas were wrong / reluctant to accept someone else's idea were right (1)	2	<b>ignore</b> references to more data available now / better technology / hard to find a pattern that works / not all of the elements had been discovered <b>not</b> some ordered by atomic number  <b>allow</b> new ideas are hard to accept

Question			Expected Answers	Marks	Rationale
1	e	i	because he arranged them in order of RAM (1)  the elements are in the wrong groups (1)	2	<b>allow</b> he swapped them round to reflect their properties <b>ignore</b> did not fit the pattern  <b>allow</b> they are with elements with different properties
		ii	(in the modern Periodic Table) elements are in order of proton number/atomic number (not RAM)	1	
	f		copper does not have similar properties to the other metals in Group 1 (1)  example (1) : copper is unreactive unlike Group 1 metals / copper is less reactive / copper has higher mp / copper has coloured compounds / copper has variable valency	2	<b>allow</b> does not have one electron in outer shell  <b>allow</b> ora
<b>Total</b>			<b>13</b>		

Question			Expected Answers	Marks	Rationale
2	a	i	$C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$	1	<b>allow</b> multiples
		ii	at lower temperature enzymes not active / at lower temperature reaction too slow (1)  at higher temperature proteins destroyed / deactivated / denatured (1)  QWC correct use of one term from collision frequency / active site / deactivated / denatured (1)	3	<b>ignore</b> references to optimum temperature <b>allow</b> reaction does not take place at low temperature <b>allow</b> reaction is slower at higher and lower temperatures = 1  <b>allow</b> yeast instead of protein <b>not</b> protein/enzyme/yeast killed
		iii	yeast killed by high concentration of ethanol	1	<b>not</b> kills enzymes <b>allow</b> ethanol is poisonous to yeast
	b	i	RFMs $C_2H_4 = 28$ and $C_2H_5OH = 46$ (1) mass ethanol = $46/28 = 1.64$ (1)	2	<b>no ecf</b> <b>allow</b> $1.64 = 2$ marks <b>allow</b> $1.6 = 1$ mark overall
		ii	ethane/crude oil/natural gas/fossil fuel will one day run out (1)  fermentation uses plant material/source that can be grown (1)	2	<b>not</b> it will run out <b>allow</b> ethane is a non-renewable source / fermentation uses a renewable source without further details for one mark only <b>ignore</b> recycling / less pollution unqualified  <b>allow</b> fermentation uses less energy (1) because it is at a lower temperature (1) / ora

Question			Expected Answers		Marks	Rationale
2	c		<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px;">ethanol</div> <div style="border: 1px solid black; padding: 2px;">oxygen</div> <div style="border: 1px solid black; padding: 2px; margin-top: 10px;">energy released</div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px;">carbon dioxide</div> <div style="border: 1px solid black; padding: 2px;">water</div> </div> </div>		3	<p>all correct (3)          four correct (2)          three or two correct (1)</p> <p><b>allow</b> ethanol and oxygen in either order (on same line)</p> <p><b>allow</b> carbon dioxide and water in either order (on same line)</p>
			<b>Total</b>		12	

Question			Expected Answers		Marks	Rationale
3	a	i	reaction is reversible / reaction goes both forwards and backwards / reaction goes both ways		1	<b>allow</b> equilibrium reaction <b>ignore</b> reference to rate of reaction / concentrations
		ii	hydrochloric acid ionises completely (1) so hydrogen ion concentration is high (1) ethanoic acid only ionises partly / equilibrium is mainly to left / most of ethanoic acid is unionised (1) so hydrogen ion concentration is low (1)		4	<b>allow</b> there are more hydrogen ions in HCl than in ethanoic acid = 1 <b>not</b> strength of acid
	b	i	$\text{CH}_3\text{COOH} + \text{C}_2\text{H}_5\text{OH} \rightleftharpoons \text{CH}_3\text{COOC}_2\text{H}_5 + \text{H}_2\text{O}$		1	<b>allow</b> molecular formulas
		ii	catalyst is not used up in the reaction		1	
		iii	mixture heated in flask (1) with condenser above (1) so no liquid is lost by evaporation / allows longer time for the reaction (1)		3	<b>allow</b> marks from diagram
			<b>Total</b>		<b>10</b>	

Question			Expected Answers						Marks	Rationale
4	a	i	(D) C E A F (B)						3	all correct (3) or one mark per correct order: C before E (1) E before A (1) A before F (1)
		ii	4.0						1	<b>allow</b> 4
	b	i	smaller range / closer together / less varied (1)  more reliable / more consistent (1)						2	<b>ignore</b> precise <b>ignore</b> reference to outliers / correlation  <b>not</b> more accurate <b>not</b> both more reliable <b>and</b> more accurate <b>allow</b> ora
		ii	$\text{mass} = 4.0 \times (60/40) \times (12.5/25) \quad (1)$ $= 4.0 \times 1.5 \times 0.5 \quad (1)$ $= 3.0 \quad (1)$ <b>or</b> $\text{mass NaOH in } 12.5 \text{ cm}^3 = 4.0 \times 12.5/1000 \quad (1)$ $= 0.05 \text{ (allow } 1.0 \times 12.5/250 = 0.05) \quad (1)$ $\text{mass acid in } 25 \text{ cm}^3 = 0.05 \times 60/40 \quad (1)$ $= 0.075 \quad (1)$ $\text{mass in } 1 \text{ dm}^3 = 0.075 \times 1000/25 \quad (1)$ $= 3.0 \quad (1)$						3	<b>allow</b> any valid method  <b>allow</b> any number in place of 4.0 as ecf  <b>allow</b> correct answer alone (3 or 3.0) for full marks  <b>allow</b> 0.075 = 2 marks
			<b>Total</b>						9	

Question		Expected Answers	Marks	Rationale
5	a	$\text{Ca}_3(\text{PO}_4)_2 + 3\text{H}_2\text{SO}_4 \rightarrow 2\text{H}_3\text{PO}_4 + 3\text{CaSO}_4$	3	formulae on left (1) formulae on right (1) balanced (1)
	b	i waste will be acidic solution (1) may kill fish / kills vegetation / leaches phosphates / has to be removed/neutralised before it is released (1)	2	<b>ignore</b> vague answers such as 'gets into water supply', 'harms the environment' etc
		ii to check for consistency (1)  to make sure concentration is what is claimed on bottle (1)	2	<b>ignore</b> mention of impurities/purity <b>allow</b> check concentration is always the same/similar  <b>allow</b> make sure it's the strength you need / make sure it is safe to use <b>ignore</b> to find the yield
	c	any two from: make sure containers are strong (1) use sealed containers / make sure containers do not leak (1) make sure containers will not be corroded by acid (1) put warnings on containers (1) make drivers aware of hazards (1) put sign giving detail to fire service on back of tanker (1)	2	<b>any two</b>  <b>ignore</b> use gloves, goggles etc

Question		Expected Answers	Marks	Rationale
5	d	any <b>two</b> from: whether feedstock is renewable or not (1) the atom economy (1) disposal of the by-products/waste (1) energy inputs / energy outputs (1) environmental impact (1) health and safety risks (1) social and economic benefits (1)	2	<b>any two</b> <b>ignore</b> specific references e.g. greenhouse gases / carbon dioxide
<b>Total</b>			<b>11</b>	

# Grade Thresholds

General Certificate of Secondary Education  
 Chemistry A (Specification Code J634)  
 June 2008 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	25	21	17	13	0
	UMS	34	N/A	N/A	N/A	30	25	20	15	10	0
A321/02	Raw	42	34	30	25	21	16	13	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	28	25	22	19	16	0
	UMS	34	N/A	N/A	N/A	30	25	20	15	10	0
A322/02	Raw	42	34	29	23	17	12	9	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	24	19	15	11	7	0
	UMS	100	N/A	N/A	N/A	60	50	40	30	20	0
A323/02	Raw	55	28	22	16	10	6	4	N/A	N/A	0
	UMS	100	90	80	70	60	50	45	N/A	N/A	0
A329	Raw	40	33	29	25	21	17	13	10	7	0
	UMS	100	90	80	70	60	50	40	30	20	0
A330	Raw	40	33	30	26	23	19	16	13	10	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 2008. 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
J634	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
J634	17.6	50.1	80.8	95.0	98.6	99.6	99.9	100.0	100.0	10 392

**11 008 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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