OCR
RECOGNISING ACHIEVEMENT

GCSE

Chemistry A
Twenty First Century Science

General Certificate of Secondary Education **J634**

Mark Scheme for the Units

January 2008

J634/MS/R/08J

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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.

Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annersley
NOTTINGHAM
NG15 0DL

Telephone: 0870 770 6622
Facsimile: 01223 552610
E-mail: publications@ocr.org.uk

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GCSE Twenty First Century Science – Chemistry A (J634)

MARK SCHEMES FOR THE UNITS

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 (1) at the end of that marking point.

4 Abbreviations, annotations and conventions used in the detailed Mark Scheme:

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

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 Annotations: the following annotations are available on SCORIS.

✓	=	correct response
✖	=	incorrect response
bod	=	benefit of the doubt
nbod	=	benefit of the doubt **not** given
ECF	=	error carried forward
^	=	information omitted
I	=	ignore
R	=	reject

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

7 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.

8 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

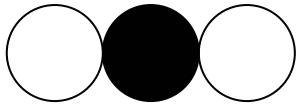
Edinburgh	
Manchester	
Paris	
Southampton	

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	i	less (1)	1	Give mark if 'less' indicated in the word list by a ring, line or some other method
		ii	less fossil fuel will be burned ☐ ✓ ☐ ☐ (1)	1	A tick in any other box = 0 marks
		iii	it is cheaper per person ☐ ✓ ☐ (1) won't be stuck in traffic jams ✓ (1)	2	One mark for each correct answer. If three boxes ticked mark these responses and deduct one mark. If four boxes ticked 0 marks
	b		all of them (1)	1	any clear indication of all of them as their choice
	c		<table><tr><th></th><th>decreases</th><th>increases</th><th>same</th></tr><tr><td>carbon dioxide</td><td></td><td>✓</td><td></td></tr><tr><td>carbon monoxide</td><td>✓</td><td></td><td></td></tr><tr><td>nitrogen oxides</td><td>✓</td><td></td><td></td></tr></table>	2	Carbon dioxide increases = 1 mark More than one tick on the row = 0 marks Carbon monoxide **and** nitrogen oxides decreases = 1 mark Tick in any other box on these two rows = 0marks
	d	i	hydrocarbons (1)	1	Give mark if 'hydrocarbons' indicated in the word list by a ring, line or some other method
		ii		1	Carbon MUST touch two oxygen circles and circles must be in correct order For carbon dioxide there must be one black circle in the middle of two white circles. Need not be linear but the two circles representing oxygen atoms must NOT touch. Allow letters in circles with no shading necessary  Allow lines connecting circles like this: 
			Total	**9**	

Question			Expected Answers	Marks	Rationale
2	a		next to the power station ✓ (1) less than 500 metres from station ✓ (1)	2	One mark for each correct answer. If three boxes ticked mark these responses and deduct one mark. If four boxes ticked 0 marks
	b	i	Dina (1)	1	More than one response = 0marks
		ii	Josh (1) Hannah (1)	2	One mark for each correct answer in EITHER order. If three names given mark answers and deduct 1 mark. 4 names given = 0
		iii	Hannah (1)	1	More than one response = 0marks
			Total	**6**	

3	a	i	density ✓ (1) cost ✓ (1)	2	One mark for each correct answer. If three boxes ticked mark these responses and deduct one mark. If four boxes ticked 0 marks
		ii	flexibility ✓ (1)	1	A tick in any other box = 0 marks
	b		wood is a renewable material ✓ (1)	1	A tick in any other box = 0 marks
	c		landfill rot burned recycled	3	4 correct (3) 3 correct (2) 2 or 1 correct (1)
			Total	**7**	

Question			Expected Answers	Marks	Rationale
4	a	i	4 (1)	1	
		ii	A (1) C (1)	2	One mark for each correct answer in EITHER order. If three letters given mark answers and deduct 1 mark. 4 letters given = 0
	b		samples of X may vary ☐ ✓ ☐ ☐ (1)	1	A tick in any other box = 0 marks
	c		7-12 (1)	1	Allow 12 -7. Allow 5 or 6 or 12-7=5
			Total	**5**	

5	a		may make children hyperactive ☐ ☐ ✓ ☐ (1)	1	A tick in any other box = 0 marks
	b		reduce risk to children's health ☐ ☐ ☐ ☐ ✓ (1)	1	A tick in any other box = 0 marks
	c		true ✓ ✓ ; false ✓	2	All three rows correct = 2 marks Two or one row correct = 1 mark Both true and false boxes ticked in one row = incorrect row
			Total	**4**	

Question			Expected Answers	Marks	Rationale
6	a		B D A C (E) B before D (1) D before A (1) A before C (1)	3	B before D (1 mark);D before A (1 mark); A before C (1 mark); If any letter is used twice. Ignore the second.
	b		food is cheaper — A less land is needed — A soil structure may be damaged — D	2	All three correct = 2 marks Two or one correct = 1 mark
	c		small fields with hedges and ditches manure instead of fertilizer rotate their crops ( ) ( ) helps prevent disease recycles waste more shelter	2	Look at the links as they leave the left-hand boxes. If any left-hand box has more than one link, count those links as incorrect. All three lines correct = 2 marks Two or one line correct = 1 mark
			Total	**7**	

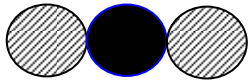
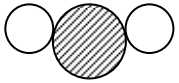
Question			Expected Answers	Marks	Rationale
7	a		exercise (1) diabetes (1)	2	
	b		banning fizzy drink machines ☐ (1) banning junk food advertising ✓ (1) ☐ ☐	2	One mark for each correct answer. If three boxes ticked mark these responses and deduct one mark. If four boxes ticked 0 marks
			Total	**4**	

			Section total	**42**	

A321/02 Modules C1, C2, C3 Higher Tier

Question			Expected Answers	Marks	Rationale
1	a	i	C and F (1)	1	**both** answers needed for one mark
		ii	A and E (1)	1	**both** answers needed for one mark
	b	i	reaction of nitrogen and oxygen ✓ (1)	1	A tick in any other box = 0 marks
		ii	cause breathing difficulties ✓ make acid rain ✓	1	Ticks in second **and** third boxes required for 1 mark. One tick or any other response = 0 marks.
	c		adding catalytic converters ✓ (1) engines work at lower temperatures ✓ (1)	2	One mark for each correct answer. If three boxes ticked mark these responses and deduct one mark. If four boxes ticked 0 marks
			Total	**6**	

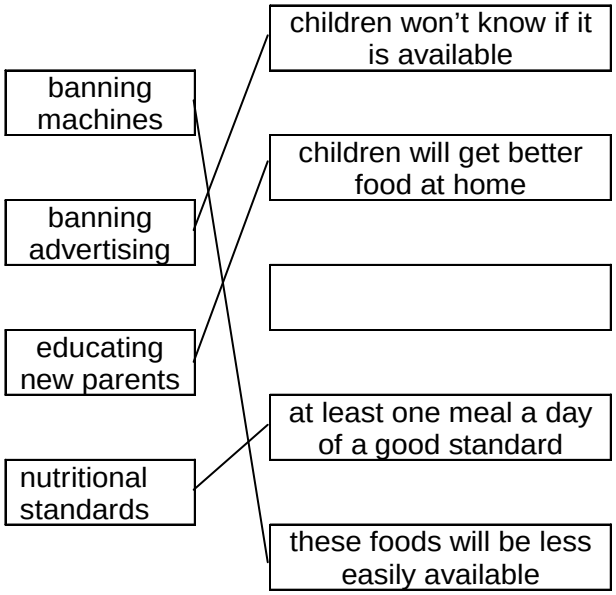
2	a		Dina (1)	1	More than one response = 0marks
	b		Josh (1) Hannah (1)	2	One mark for each correct answer in EITHER order. If three names given mark answers and deduct 1 mark. 4 names given = 0
	c		Hannah (1)	1	More than one response = 0marks
			Total	**4**	

Question			Expected Answers	Marks	Rationale
3	a		CO_2 and water vapour are gasses ☐ petrol burns ✓ ☐ ✓	1	Ticks in second **and** fourth boxes required for 1 mark. One tick or any other response = 0 marks.
	b		carbon dioxide drawn (1)  water drawn (1)  **two** correct water and **two** correct carbon dioxide molecules drawn (1)	3	For carbon dioxide there must be one black circle in the middle of two shaded circles. The two shaded circles must not touch each other. For water there must be one shaded circle in the middle of two blank circles. The two blank circles must not touch each other. Shapes may be linear or bent. For both diagrams: **allow** letters in circles like this:  **allow** lines connecting circles like this: 
			Total	**4**	

Question			Expected Answers	Marks	Rationale
4	a	i	(crude) oil / alkene / ethene / petroleum / naptha (1)	1	One mark for any correct answer
		ii	polymerisation / polymerising (1)	1	**Reject**: polymer.
	b		thicker bags last longer ✓ total amount of plastic used is less ✓	1	Ticks in third **and** fifth boxes required for 1 mark. One tick or any other response = 0 marks.
	c		Recycling / recycle / recycled (1)	1	
	d		need for burning fuel is reduced ✓ energy made when they burn is used ✓	1	Ticks in third **and** sixth boxes required for 1 mark. One tick or any other response = 0 marks.
	e		space in landfill but then rot away ✓ (1)	1	A tick in any other box = 0 marks
			Total	**6**	

Question			Expected Answers	Marks	Rationale
5	a	i	4 (1)	1	**Accept**: a circle around 'Sample 4' or number '7' in Sample 4. More than one number circled = 0 marks
		ii	A (1) C (1)	2	One mark for each correct answer in EITHER order. If three letters given mark answers and deduct 1 mark. 4 letters given = 0
	b		samples of X may vary ☐ / ✓ / ☐ / ☐ (1)	1	A tick in any other box = 0 marks
	c		7-12 (1)	1	**Allow** 12 -7. **allow** 5 or 6 or 12-7=5
	d		Anna (1)	1	More than one name = 0 marks
	e	i	☐ / ☐ / ☐ / ✓ cannot slide past each other (1)	1	A tick in any other box = 0 marks
		ii	☐ / ✓ strong forces between molecules / ☐ / ☐ / ✓ break polymer molecules apart	1	Ticks in second **and** fifth boxes required for 1 mark. One tick or any other response = 0 marks.
			Total	**8**	

Question			Expected Answers	Marks	Rationale
6	a		may make children hyperactive ✓ (1)	1	A tick in any other box = 0 marks
	b		reduce risk to children's health ✓ (1)	1	A tick in any other box = 0 marks
	c		true: ✓ ✓ ; false: ✓	2	All three rows correct = 2 marks Two or one row correct = 1 mark Both true and false boxes ticked in one row = incorrect row.
			Total	**4**	

Question			Expected Answers	Marks	Rationale
7	a			3	Look at the links as they leave the left-hand boxes. If any left-hand box has more than one link, count those links as incorrect. All four lines correct = 3 marks Three lines correct = 2 marks Two lines correct = 1 mark One or no lines correct = 0 marks
	b	i	diabetes in overweight children ✓ (1) consequences of being diabetic ✓ (1)	2	One mark for each correct answer. If three boxes ticked mark these responses and deduct one mark. If four boxes ticked 0 marks
		ii	Andy (1) Laura (1)	2	One mark for each correct answer in EITHER order. If three names given mark answers and deduct 1 mark. 4 names given = 0
			Total	**7**	

Question			Expected Answers	Marks	Rationale
8	a		E (1) C (1)	2	One mark for each correct answer in EITHER order. If three letters given mark answers and deduct 1 mark. 4 or more letters given = 0
	b		bacteria in the roots of some plants ✓ lightning ✓	1	Ticks in second **and** third boxes required for 1 mark. One tick or any other response = 0 marks.
			Total	**3**	

			Section total	**42**	

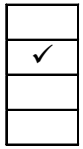
A322/01 Modules C4, C5, C6 Foundation Tier

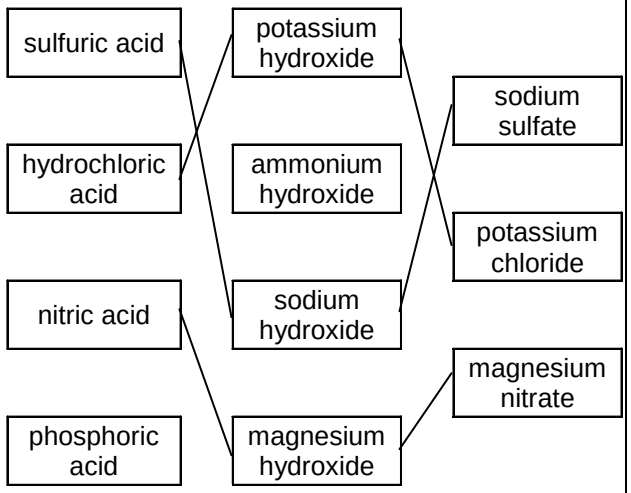
Question			Expected Answers	Marks	Rationale
1	a	i	increases increases / decreases decreases (1)	1	**allow** either increases and increases for one mark or decreases and decreases for one mark allow pairs of words with the same meaning eg smaller smaller / larger larger / rises rises / falls falls / gets higher gets higher / gets lower gets lower
	a	ii	gas (1)	1	**allow** in table more than one circled = 0
		iii	black (1)	1	more than one circled = 0
	b	i	chlorine bromine iodine ✓ (1)	1	2nd box
		ii	chlorine, bromine and iodine ✓ (1)	1	1st box
	c		C (1)	1	more than one letter = 0
			Total	**6**	

Question			Expected Answers	Marks	Rationale
2	a	i	Li Na K ☐☐☐☐✓ (1)	1	4th box
		ii	Na Mg Ar ✓☐☐☐ (1)	1	1st box
	b		beryllium (1) 4 (1) 9 (1)	3	**allow** one mark for 4 and 9 in the wrong order, therefore beryllium 9 4 = 2 marks
	c		four electrons drawn on or touching the outer shell or circle (1)	1	**allow** electrons drawn singly or in pairs / x for electron extra shell with electron(s) / extra electrons in inner shell = 0
	d	i	conducts electricity ☐☐☐✓ (1)	1	4th box
		ii	2.8 (1) 2.8.8 (1)	2	**allow** 2.8.0 and 2.8.8.0 **ignore** + or - symbols
			Total	**9**	

Question			Expected Answers	Marks	Rationale
3	a		sodium chloride / sodium sulfate / sodium carbonate / sodium bromide / potassium chloride / potassium sulfate / potassium carbonate / potassium bromide / magnesium chloride / magnesium carbonate / magnesium bromide / calcium chloride / calcium sulfate / calcium carbonate / calcium bromide	1	**not** magnesium sulphate formula = 0
	b		between ions of opposite charge ✓ (1)	1	2nd box
	c		able to move around in sea water ✓ (1) contains ions that have positive charges and negative charges ✓ (1)	2	1st box 4th box
	d		sodium chloride (1)	1	**allow** Na C*l* ignore + or - symbols **reject** sodium chlorine / (common) salt
			Total	**5**	

Question			Expected Answers	Marks	Rationale
4	a		covalent hard high insoluble does not	4	4 correct (3) 3 correct (2) 2 correct (1)
	b		nitrogen and oxygen (1)	1	**both** answers required for (1) mark more than two circled = 0
			Total	**5**	

Question			Expected Answers	Marks	Rationale
5	a		carbon (1)	1	formula = 0
	b		copper (1) zinc (1)	2	each additional circle above 2 loses one mark
	c	i	aluminium is more reactive  (1)	1	2nd box
		ii	electrolysis (1)	1	**reject** electricity
			Total	**5**	

Question			Expected Answers	Marks	Rationale
6	a		neutralisation (1)	1	
	b			3	one mark for drawing a line from each acid to the correct alkali and correct salt. two lines to or from one box loses the mark for that salt ignore extra line from phosphoric acid to ammonium hydroxide.
	c		H_2 (1)	1	more than one circled = 0
			Total	**5**	

Question			Expected Answers	Marks	Rationale
7	a		filtration / filtering / filter / decantation / decant (1)	1	
	b	i	84 (1) 120 (1)	2	ignore units
		ii	90 (1)	1	ignore units
	c	i	finishes at the same volume ☐ ☐ ☐ ✓ (1)	1	4th box
		ii	A D	1	**both** answers required for one mark must be in the correct order
		iii	increasing the temperature ☐ ✓ (1) ☐	1	2nd box
			Total	**7**	

			Section total	**42**	

A322/02 Modules C4, C5, C6 Higher Tier

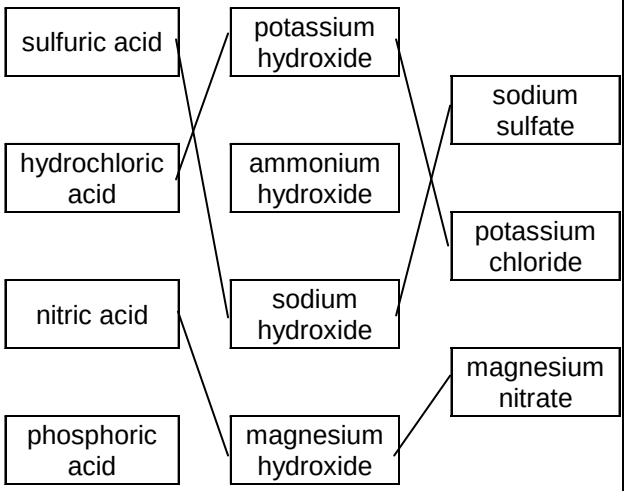
Question			Expected Answers	Marks	Rationale
1	a	i	liquid solid	1	**both** required for one mark
		ii	increases increases / decreases decreases (1)	1	**allow** either increases and increases for one mark or decreases and decreases for one mark **allow** pairs of words with the same meaning eg smaller smaller / larger larger / rises rises / falls falls / gets higher gets higher / gets lower gets lower
	b	i	most reactive ……chlorine …..bromine least reactive ……iodine	2	chlorine first for one mark then bromine and iodine in correct order for one mark. **not** chloride, bromide, iodide.
		ii	chlorine, bromine and iodine ✓ (1)	1	1st box
	c		Sr^{2+} / Sr^{++}/ Sr^{+2} (1)	1	
			Total	**6**	

Question			Expected Answers	Marks	Rationale
2	a	i	K potassium / Br bromine / Sc scandium /Ti titanium / V vanadium / Cr Chromium / Mn Manganese / Fe iron / Co cobalt / Ni nickel / Cu copper / Zn zinc / Ga gallium / Ge germanium / As arsenic / Se selenium / Kr krypton (1)	1	symbol must match name
		ii	He helium / Ar argon / Kr krypton / Xe xenon / Rn radon (1)	1	symbol must match name
		iii	eight electrons drawn on or touching each of the second and third shells	1	Allow electrons drawn singly or in pairs
	b	i	$2Na_{(s)} + Cl_{2(g)} \rightarrow 2NaCl_{(s)}$ formulae Na, Cl_2, NaCl (1) balance 2Na and 2NaCl (1) state symbols (s), (g) and (s) (1)	3	balance mark not available if any formula incorrect. states written as words eg. solid and gas = 0.
		ii	conducts electricity ☐ ☐ ☐ ☑ (1)	1	4th box
		iii	2.8 (1) 2.8.8 (1)	2	**allow** 2.8.0 and 2.8.8.0 **ignore** + or - symbols
			Total	**9**	

Question			Expected Answers	Marks	Rationale
3	a	i	sodium chloride NaCl / sodium sulfate $NaSO_4$ / sodium carbonate Na_2CO_3 / sodium bromide NaBr / potassium chloride KCl / potassium sulfate K_2SO_4 / potassium carbonate K_2CO_3 / potassium bromide KBr / magnesium chloride $MgCl_2$ / magnesium carbonate $MgCO_3$ / magnesium bromide $MgBr_2$ / calcium chloride $CaCl_2$ / calcium sulfate $CaSO_4$ / calcium carbonate $CaCO_3$ / calcium bromide $CaBr_2$	2	**not** magnesium sulfate $MgSO_4$ one mark for name and one mark for formula Ignore + or – symbols if given
		ii	sodium chloride (1)	1	**allow** Na Cl or Na^+ Cl^- **ignore** + or - symbols **reject** sodium chlorine / (common) salt
	b		able to move around in sea water ✓ contains ions that have positive charges and negative charges ✓	1	1st box and 4th box **both** required for one mark
	c		ions attraction opposite	1	all three in correct order for one mark
	d		high melting point ✓ low electrical conductivity ✓	1	5th box and 6th box **both** required for one mark a tick in any other box = 0
			Total	**6**	

Question			Expected Answers	Marks	Rationale
4	a		covalent four high low low	3	all five correct (3) 4 correct (2) 3 correct (1)
	b		hydrogen oxygen nitrogen (1)	1	all three in any order for one mark
			Total	**4**	

Question			Expected Answers	Marks	Rationale
5	a		$2Fe_2O_3 + 3C \rightarrow 4Fe + 3CO_2$ formulae Fe and CO_2 (1) balance using 4 numbers shown - 2 3 4 3 (1)	2	balance mark not available if any formula incorrect. Fe and CO_2 can be in any order. 4 must be with Fe and 3 must be with CO_2.
	b		800 (1) 160 (1) 560 (1)	3	
			Total	**5**	

Question			Expected Answers	Marks	Rationale
6	a			3	one mark for drawing a line from each acid to the correct alkali and correct salt. two lines to or from one box loses the mark for that salt **ignore** extra line from phosphoric acid to ammonium hydroxide.
	b	**i**	H^+ / H_3O^+ (1)	1	
		ii	OH^- (1)	1	
		iii	$H^+ + OH^- \rightarrow H_2O$ / $H_3O^+ + OH^- \rightarrow 2H_2O$ (1)	1	
			Total	**6**	

<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Rationale</th></tr>
<tr><td>7</td><td>a</td><td>i</td><td>90 (1)</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>ii</td><td>8.4 (1)</td><td>1</td><td></td></tr>
<tr><td></td><td>b</td><td>i</td><td>A
D</td><td>1</td><td>both answers required for one mark
must be in the correct order</td></tr>
<tr><td></td><td></td><td>ii</td><td><table><tr><th>slower</th><th>same</th><th>faster</th></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></td><td>3</td><td>5 correct (3)
4 correct (2)
3 correct (1)</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>6</td><td></td></tr>
</table>

			Section total	**42**	

Grade Thresholds

General Certificate of Secondary Education
Chemistry A (Specification Code J634)
January 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	33	28	23	19	15	0
	UMS	34	N/A	N/A	N/A	30	25	20	15	10	0
A321/02	Raw	42	36	32	27	22	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	25	21	17	14	11	0
	UMS	34	N/A	N/A	N/A	30	25	20	15	10	0
A322/02	Raw	42	35	28	21	14	8	5	N/A	N/A	0
	UMS	50	45	40	35	30	25	23	N/A	N/A	0

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

No candidates were entered for aggregation this series. First aggregation opportunity is in June 2008.

For a description of how UMS marks are calculated see:
http://www.ocr.org.uk/learners/ums_results.html

Statistics are correct at the time of publication.

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

OCR Customer Contact Centre

14 – 19 Qualifications (General)
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

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Facsimile: 01223 552553