OCR
RECOGNISING ACHIEVEMENT

GCSE

Chemistry A
Twenty First Century Science

General Certificate of Secondary Education **J634**

Mark Scheme for the Units

June 2009

J634/MS/R/09

Oxford Cambridge and RSA Examinations

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of pupils of all ages and abilities. OCR qualifications include AS/A Levels, GCSEs, OCR Nationals, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new syllabuses to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support which keep pace with the changing needs of today's society.

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
Annesley
NOTTINGHAM
NG15 0DL

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

CONTENTS

GCSE Twenty First Century Science – Chemistry A (J634)

MARK SCHEMES FOR THE UNITS

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
not/reject	=	answers which are not worthy of credit
ignore	=	statements which are irrelevant - applies to neutral answers
allow/accept	=	answers that can be accepted
(words)	=	words which are not essential to gain credit
words	=	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.

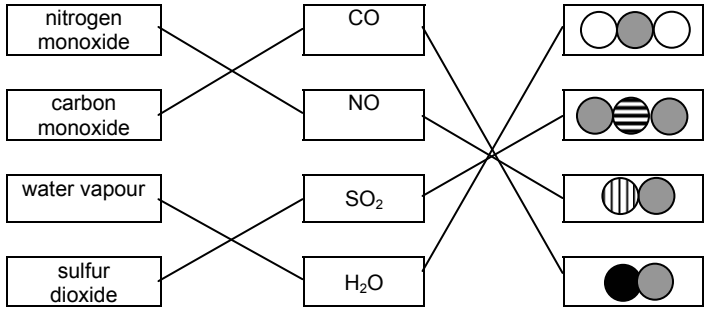
Eg If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third <u>should be blank</u> (or have indication of choice crossed out).

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			4	Mark left and right hand sides independently Matching name to formula – two marks for all correct, one mark for two or three correct. (max 2) Matching formula to molecule – two marks for all correct, one mark for two or three correct (max 2) If 2 lines leave or arrive at one box then the mark is lost
	b	i	sulfur dioxide/nitrogen monoxide/SO_2/NO	1	either formula must be correct if used
		ii	carbon monoxide/CO	1	formula must be correct if used
		iii	water (vapour)/H_2O	1	formula must be correct if used
			Total	**7**	

Question			Expected Answers	Marks	Rationale
2	a		... reliable results ✓ (1)	1	3rd box
	b	i	... well outside the range ... ✓ (1)	1	2nd box
		ii	... wind changed direction ... ✓ (1) ... burned less coal ... ✓ (1)	2	4th and 5th boxes

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

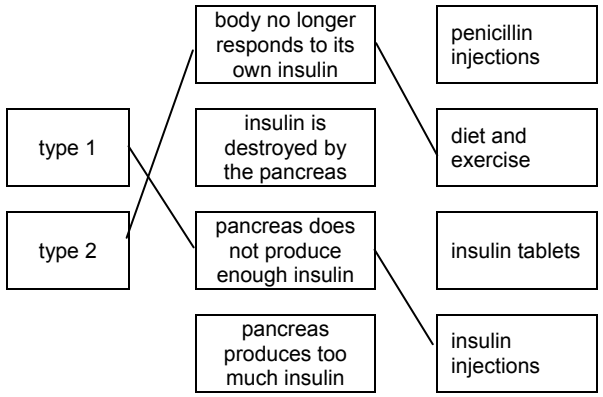
Question			Expected Answers	Marks	Rationale
3	a		... using the spoon ✓ (1)	1	3rd box
	b		Supply of metal ores is finite. ✓ (1) More trees can be planted ... ✓ (1) Plastics made from crude oil ... ✓ (1)	3	2nd, 4th and 6th boxes

Question			Expected Answers	Marks	Rationale
3	c		... metal spoon not stained... ✓ (1) ... plastic spoon too soft ... ✓ (1) ... wooden spoon stained ... ✓ (1)	3	2nd, 3rd and 5th boxes
			Total	**7**	

Question			Expected Answers	Marks	Rationale
4	a		**cotton** **(polyester)** **silk** **wool**	1	correct word circled and no other words circled
	b		small; long; polymerisation;	3	one mark for each correct choice
	c	i	carbon ✓ (1) hydrogen ✓ (1)	2	1st and 4th boxes
		ii	**food** **(fuels)** **lubricants**	1	
			Total	**7**	

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

Question			Expected Answers	Marks	Rationale
5	b	ii	... safe levels of chemicals ... ✓ (1)	1	3rd box
			Total	**7**	

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

A321/02 Modules C1, C2, C3 Higher Tier

Question			Expected Answers	Marks	Rationale
1	a		<table><tr><td>sulfur dioxide</td><td>SO_2</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></table>	3	one mark for each correct row do not allow SO^2/So_2/sO_2 do not allow sulfur oxide/sulfur monoxide/sulfur trioxide **allow** sulfur(IV) oxide do not allow nitrogen oxide/nitrogen dioxide/nitrous oxide **allow** nitric oxide/nitrogen(II) oxide do not allow No/nO do not allow carbon oxide/carbon dioxide **allow** carbon(II) oxide do not allow Co/cO
	b		[1] **[3]** **[2]** **[2]**	3	one mark for each correct number after [1]
			Total	**6**	

Question			Expected Answers	Marks	Rationale
2	a		... reliable results ✓ (1)	1	3rd box
	b	i	... well outside the range ... ✓ (1)	1	2nd box
		ii	... wind changed direction ... ✓ (1) ... burned less coal ... ✓ (1)	2	4th and 5th boxes

Question			Expected Answers	Marks	Rationale
2	c		... ranges don't overlap. ✓ (1) ... mean before is outside range after ... ✓ (1)	2	3rd and 5th 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
			Total	**8**	

Question			Expected Answers	Marks	Rationale
3	a		... using the spoon ✓ (1)	1	3rd box
	b		Supply of metal ores is finite. ✓ (1) More trees can be planted ... ✓ (1) Plastics made from crude oil ... ✓ (1)	3	2nd, 4th and 6th boxes

Question			Expected Answers	Marks	Rationale
3	c		... use and disposal ... ✓ (1) ... making the product from the material. ✓ (1)	2	2nd and 4th boxes
	d		... available locally ... ✓ It is easy to make wooden spoons ... ✓	1	**both** 1st and 3rd boxes for one mark three or more boxes ticked = 0 marks
			Total	**7**	

Question			Expected Answers	Marks	Rationale
4	a	i	B C D	1	one mark for **any two** 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 **both** correct letters in either order do not allow the mark if more than two letters are given
		iii	A D	1	one mark for **both** correct letters in either order do not allow the mark if more than two letters are given
	b		... less plasticizer ... ✓ (1) Increase chain length ... ✓ (1)	2	1st and 5th boxes
	c		... forces between the molecules. ✓ … forces between the polymer chains stronger. ✓ … but weak forces between … ✓	2	**all three** of 1st, 4th and 5th boxes for **two marks** two boxes correct with or without a third incorrect one = 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
			Total	**7**	

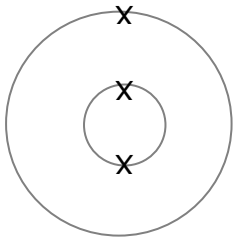
Question			Expected Answers	Marks	Rationale
5	a	i	Plants take nitrogen ... ✓ (1) When crops are harvested ... ✓ (1)	2	2nd and 5th boxes
		ii	carbon (1) and hydrogen (1)	2	one mark for each correct word, in either order for three words max 1 mark, for four words no marks for hydrogen allow H or H_2 but not h or h_2 for carbon allow C but not C_2 etc
	b	i	Some crops naturally contain toxic ... ✓ (1) During storage, crops contaminated ... ✓ (1)	2	1st and 5th boxes

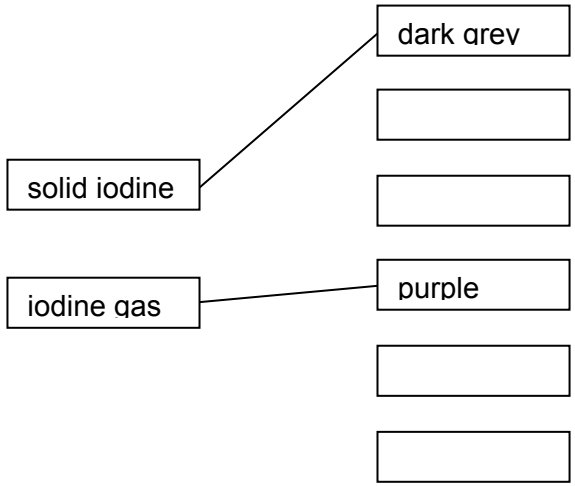
Question			Expected Answers	Marks	Rationale
5	b	ii	... easier to make ... ✓ ... more expensive ... ✓	1	**both** 1st and 3rd boxes for one mark three or more boxes ticked = 0 marks
			Total	**7**	

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		... pancreas does not produce enough ... ✓ Sugar ... is quickly absorbed ... ✓ ... to regulate the amount of sugar ... ✓	2	all three of 2nd, 3rd and 6th 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		the chance ... contracting type 2 ... ✓ (1) the consequences of ... diabetes ✓ (1)	2	2nd and 5th boxes
			Total	**7**	

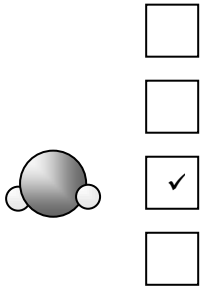
A322/01 Modules C4, C5, C6 Foundation Tier

Question			Expected Answers	Marks	Rationale
1	a		<table><tr><th></th><th>true</th><th>false</th></tr><tr><td>… reacts with cold water.</td><td>✓</td><td></td></tr><tr><td>… to form compounds.</td><td></td><td>✓</td></tr><tr><td>… quicker than potassium.</td><td></td><td>✓</td></tr><tr><td>… is very unstable.</td><td></td><td>✓</td></tr></table>	2	all 4 correct = 2 2 or 3 correct = 1 1 correct = 0 **Accept** other indications of choice (eg lines or crosses)
	b	i	protons (1) neutrons (1)	2	either order
		ii	3 electrons arranged 2 inside the inner shell, 1 in the outer shell	1	
			Total	**5**	

Question			Expected Answers	Marks	Rationale
2	a	i		2	(1) mark for each correct line. If more than 2 lines are drawn, deduct (1) for each additional incorrect line.
		ii	Do experiments in a fume cupboard. ✓ Do not breathe in the gas. ✓	2	**Accept** other indications of choice (eg lines or crosses)

Question			Expected Answers	Marks	Rationale
2	b		Iodine solution kills bacteria. ✓	1	**Accept** other indications of choice (eg lines or crosses)
				5	

Question			Expected Answers	Marks	Rationale
3	a		the colour of the flame ☐ ✓ ☐ ☐	1	**Accept** other indications of choice (eg lines or crosses)
	b		a fixed pattern of lines ✓ ☐ ☐ ☐	1	**Accept** other indications of choice (eg lines or crosses)
	c		potassium (1) chlorine (1)	2	either order **accept** any phonetic spellings **reject** 'chloride'
			Total	**4**	

Question			Expected Answers	Marks	Rationale
4	a			1	If more than 1 box is ticked, 0 marks
	b		C and H only in the formula (1) Fully correct formula: C_2H_4 (2)	2	C and H must be capitals eg Ch_4 scores (0) C_2h_4 scores (1) **allow** $H_4C_2/CH_2CH_2/H_2C_2H_2/H_2CCH_2$ Any number in front of formula, can only score first mark eg $2CH_2$ scores (1) 2 and 4 must be clearly subscripted or smaller than C and H eg C2H4 or C^2H^4 scores (1)
			Total	**3**	

Question			Expected Answers	Marks	Rationale
5	a	i	more more less	2	all 3 correct = 2 1 or 2 correct = 1 Allow other indications of choice eg underlining
		ii	50-65% (1)	1	
	b		**use** **property** car air → very jewellery → easily bent gold → good	2	all 3 correct = 2 1 or 2 correct = 1 If more than 3 lines are drawn, deduct (1) for each additional incorrect line.
			Total	**5**	

Question			Expected Answers	Marks	Rationale
6	a		Bubbles form around an electrode. ✓ The bulb lights up. ✓	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	**Allow** led Allow correct symbol Pb Do not allow PB
			Total	**6**	

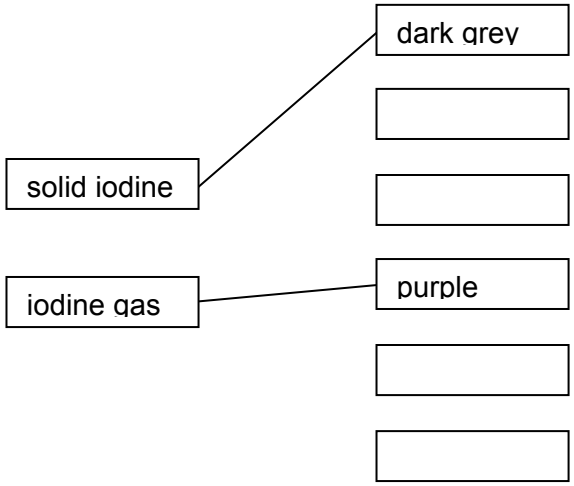
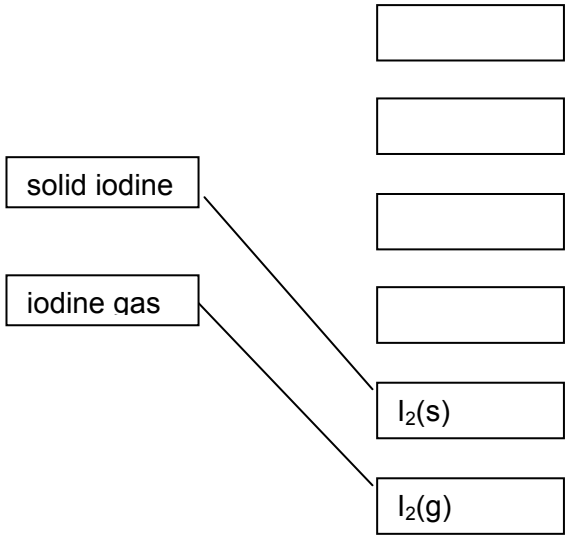
Question			Expected Answers	Marks	Rationale
7	a	i	sulfuric (acid)/sulphuric (acid) (1)	1	**accept** phonetic spelling
		ii	magnesium carbonate (1) magnesium oxide (1)	2	If more than two compounds are ringed, deduct (1) for each additional incorrect compound. Allow other indications of choice eg underlining
	b		use acid that is more dilute ☐ ☐ ✓ ☐	1	If more than 1 box is ticked, 0 marks
			Total	**4**	

<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Rationale</th></tr>
<tr><td>8</td><td>a</td><td></td><td>☐
☐
☐
indicator paper ✓</td><td>1</td><td>If more than 1 box is ticked, 0 marks</td></tr>
<tr><td></td><td>b</td><td></td><td><table><tr><th>chemical</th><th>acidic …</th><th>pH</th></tr><tr><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><td></td><td></td><td></td></tr><tr><td></td><td></td><td>8-10</td></tr></table></td><td>3</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>4</td><td></td></tr>
</table>

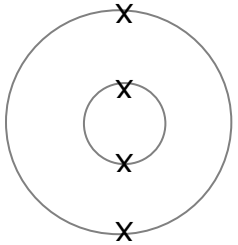
Question			Expected Answers	Marks	Rationale
9	a		hydrochloric acid (1) burette (1) flask (1)	3	
	b		neutralisation (1)	1	If more than one answer is ringed, deduct (1) for each additional incorrect response. Allow other indications of choice eg <u>underlining</u>
	c	i	40 (1)	1	
		ii	She spilled some chemicals. ☐ ✓ ☐ ☐	1	If more than 1 box is ticked, 0 marks
			Total	**6**	

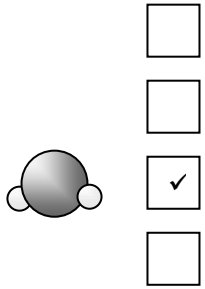
A322/02 Modules C4, C5, C6 Higher Tier

Question			Expected Answers	Marks	Rationale
1	a		<table><tr><th></th><th>true</th><th>false</th></tr><tr><td>… reacts with cold water.</td><td>✓</td><td></td></tr><tr><td>… to form compounds.</td><td></td><td>✓</td></tr><tr><td>… quicker than potassium.</td><td></td><td>✓</td></tr><tr><td>… is very unstable.</td><td></td><td>✓</td></tr></table>	2	all 4 correct = 2 2 or 3 correct = 1 1 correct = 0 **Accept** other indications of choice (eg lines or crosses)
	b		Correct symbols: Li and O_2(1) Correct balancing: $4Li + O_2$ (1)	2	Must have capital L and lower case i in Li and capital O with subscripted 2 in O_2. **Do not allow** LI Top of the number 2 in O_2 should not be above half the height of the O, **Do not allow** O2. Second mark can only be scored if formulae are correct. **Allow** second mark if small errors in formula eg 4Li + O2 scores (1) **Allow** $4Li + 1\ O_2$ Any other number in front of O_2 does not score this mark.
			Total	**4**	

Question			Expected Answers	Marks	Rationale
2	a	i		2	(1) mark for each correct line. If more than 2 lines are drawn, deduct (1) for each additional incorrect line.
		ii		2	(1) mark for each correct line. If more than 2 lines are drawn, deduct (1) for each additional incorrect line.

Question			Expected Answers	Marks	Rationale
2	b		Iodine is in Group 7. ✓ All Group 7 elements kill bacteria. ✓	1	Both must be correct for (1) mark If more than two ticks, 0 marks
			Total	**5**	

Question			Expected Answers	Marks	Rationale
3	a		… light of different colours. ☐ ☐ … light of different colours. ✓ ☐ … very hot and so emit light. ✓	2	If more than two ticks are given, deduct (1) mark for each additional incorrect tick. **Allow** other indications of choice.
	b		protons and neutrons named in either order (1) correct numbers of protons and neutrons: 4 protons, 5 neutrons (1) 4 electrons in arrangement 2,2 (1)	3	Second mark cannot be scored if protons and neutrons not named. 4 neutrons and 5 protons scores first mark only (1) **Allow** phonetic spelling of protons and neutrons. eg two electrons anywhere in **each** 'ring'.  **Allow** other symbols for electrons eg e, **-** or o
			Total	**5**	

Question			Expected Answers	Marks	Rationale
4	a			1	If more than 1 box is ticked, 0 marks
	b		C and H only in the formula (1) Fully correct formula: C_2H_4 (2)	2	C and H must be capitals eg Ch_4 scores (0) C_2h_4 scores (1) **allow** H_4C_2 / CH_2CH_2 / $H_2C_2H_2$ / H_2CCH_2 Any number in front of formula, can only score first mark eg $2CH_2$ scores (1) 2 and 4 must be clearly subscripted or smaller than C and H eg C2H4 or C^2H^4 scores (1)
			Total	**3**	

Question			Expected Answers	Marks	Rationale
5	a		Potassium iodide is an ionic compound. ✓ Ions in the liquid are free to move. ✓	2	If more than two ticks are given, deduct (1) mark for each additional incorrect tick. **Allow** other indications of choice.
	b		lead (1)	1	**Allow** led **Allow** correct symbol Pb **Do not allow** PB
	c		e^-/e	1	**Do not allow** word 'electron'
			Total	**4**	

Question			Expected Answers	Marks	Rationale
6	a		C (1)	1	**Allow** lower case More than one letter scores 0
	b		A (1)	1	As above
	c		D (1)	1	As above
	d		Electrons are shared between atoms. ☐ Electrons are shared between atoms. ✓ The nucleus of each bonded atom … ✓ The nucleus of each bonded atom … ☐ ☐	2	If more than two ticks are given, deduct (1) mark for each additional incorrect tick. **Allow** other indications of choice.
	e		MgF_2 (1)	1	Must have capital M and lower case g in Mg and full size F with subscripted 2. **Do not allow** MGF_2/Mg2F/MgF^2 /Mg_2F /F_2Mg Top of the number 2 after F should not be above half the height of the F, **Do not allow** MgF2. Do not allow if any number is in front of formula eg $2MgF_2$ scores 0
			Total	**6**	

Question			Expected Answers	Marks	Rationale
7	a	i	sulfuric (acid)/sulphuric (acid) (1)	1	**accept** 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	i	☐ ☐ ☐ All the acid is used up. ✓	1	If more than 1 box is ticked, 0 marks
		ii	☐ ☐ to get more magnesium sulfate … ✓ ☐	1	If more than 1 box is ticked, 0 marks

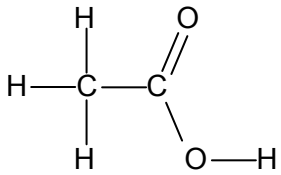
Question			Expected Answers	Marks	Rationale
7	b	iii	<table><tr><th></th><th>true</th><th>false</th></tr><tr><td>… largest crystals.</td><td></td><td>✓</td></tr><tr><td>…as he heats it.</td><td>✓</td><td></td></tr><tr><td>… faster the crystals form.</td><td></td><td>✓</td></tr><tr><td>… solid salt evaporate.</td><td></td><td>✓</td></tr></table>	2	All 4 correct = 2 2 or 3 correct = 1 1 correct = 0
	c		<table><tr><td></td></tr><tr><td></td></tr><tr><td>use acid that is more dilute ✓</td></tr><tr><td></td></tr></table>	1	If more than 1 box is ticked, 0 marks
			Total	**8**	

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	**both** needed for the mark If more than two letters ringed, 0 marks
	b		K^+ ringed and both K_2^{2+} and K^{2+} unringed (1) SO_4^{2-} ringed and both S^{2-} and O^{2-} unringed (1)	2	
	c		**true** **false** … produces a precipitate. ☐ ✓ … is a neutralisation reaction. ✓ ☐ … produces OH^- ions. ☐ ✓ An equation for the reaction is … ✓ ☐ Hydrogen gas is given off. ☐ ✓	3	All 5 correct = 3 4 correct = 2 2 or 3 correct = 1 1 correct = 0
			Total	**7**	

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

Question			Expected Answers	Marks	Rationale
1	a	i	**any two from:** corn; maize; sugar (beet);	1	both required for the mark
		ii	Austria (1)	1	
	b		**any two from:** 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	**any two from:** (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	**ignore** 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	**allow** description of carbon cycle for bioethanol **allow** bioethanol is renewable
			Total	**13**	

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_3 correct (1) structure of COOH correct (1)	2	
			Total	**10**	

Question			Expected Answers	Marks	Rationale
3	a		as an energy store (1)	1	
	b	i	glycerol (1) + fatty acids (1)	2	either order **allow** 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	**allow** it is a (dynamic) equilibrium **allow** forward and reverse rates are the same
	c		as flavouring/to improve taste (1) to give the required smell/to improve smell (1)	2	
			Total	**7**	

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 **2** marks
	b	i	ethane propene butane	2	any order all correct = 2 marks 2 correct 1= 1 mark **reject** propane
		ii	propene (1)	1	**reject** propane
		iii	propene (1)	1	**reject** propane
	c	i	**any two from:** 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	**allow** they have unreactive bonds for 1 mark only **ignore** 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	**allow** as alternative words exothermic = releases energy, endothermic = takes in energy marks can be scored from an annotated energy level diagram
			Total	**10**	

Question			Expected Answers	Marks	Rationale
5	a		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
	b	i	measuring cylinder (1)	1	**allow** pipette
		ii	burette (1)	1	
	c	i	use of 24, 16 and 1 in calculation but processed incorrectly (1) 58 (1)	2	**allow** first mark for calculations otherwise correct but missing out a step eg 2 x 1 or 2 x 16 **do not allow** first mark for totally incorrect calculation eg 24 x 16 x 1 **allow** 2 marks for correct answer without working
		ii	0.75 (1)	1	**allow** 0.747/0.746 **allow** ecf from 5(c)(i)
			Total	**8**	

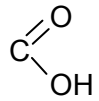
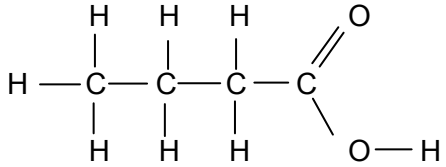
Question			Expected Answers	Marks	Rationale
6	a	i	a chemical made in large quantities (1)	1	
		ii	it is made from ethene which is made from crude oil (1) crude oil/ethene is finite/crude oil/ethene will run out (1)	2	
	b	i	the calcium chloride must be dumped/the calcium chloride must be disposed of (1)	1	**must** imply that calcium chloride has to be disposed of – **not** 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	**allow** make safe **allow** harming others by misuse
			Total	**7**	

			Paper Total	**55**	

A323/02 Unit 3 Ideas in Context plus C7 Higher Tier

Question			Expected Answers	Marks	Rationale
1	a		pollution is caused/carbon dioxide is released by the production process (1) it gives 70% of the mileage of petrol (1)	2	**allow** as bioethanol is made = production process **ignore** releases 34% less energy unless qualified **allow** eg it gives less miles (per gallon) than petrol
	b		this would use wheat/land that is now used for food/cause decline in soil fertility/decrease water supply/quality/increase fertiliser use (1) 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)	2	Any two **ignore** uses a lot of land/would use too much land **ignore** references to decreasing habitats for animals **ignore** would have to import bioethanol
	c		these countries struggle to feed everyone/ need all their crops for food (1) making bioethanol will cause a food shortage/cause famine (1)	2	**ignore** references to land quality/rainfall/technology/cars/**ignore** copied statement 'The amount of grain …. an African village'.
	d		RFM octane 114 **and** RFM carbon dioxide 44 (1) mass of carbon dioxide = (8x44)/114 = 3.1 g (1) percentage = 100 x (3.1-1.9)/1.9 = 63 **or** percentage = [(3.1/1.9) x 100] – 100 = 63 (1)	3	**allow** 352 for 44 (ie 8 x 44) **allow** 2 marks for correct mass of carbon dioxide alone **allow** 3.08 g/3.09 g/3.087 g/3.088 g **allow** any answer between 62.0 and 63.2 but **do not allow** an answer that is derived from incorrect working **allow** ecf from mass answer for % from 55 to 65 only **do not** give mark for 60% unless **working** gives 3.04 for mass

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 **ignore** renewable unqualified
		ii	petrol/crude oil is finite/not renewable (1) bioethanol is made from crops, which we can grow more of (1)	2	**allow** description of carbon cycle for bioethanol **allow** bioethanol is renewable
			Total	**13**	

Question			Expected Answers	Marks	Rationale
2	a		COOH	1	**allow** CO_2H **allow** 
	b	i	$CaCO_3 + 2HCOOH \rightarrow Ca(HCOO)_2 + CO_2 + H_2O$	2	one mark for all formulae correct, one mark for balance balance mark can only be scored if formulae correct **allow** molecular formulae subscript numbers must be clearly subscript or no marks
		ii	calcium methanoate is soluble (1)	1	
		iii	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)	4	**only give the third marking point** if there is no suggestion that the strong acid also has a (dynamic) equilibrium **ignore** 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	**allow** CH_3 for methyl group/$CH_3CH_2CH_2COOH$ **allow** COOH for carboxyl group/OH instead of O-H **allow** correct structure with a circle around each atom **reject** molecule drawings using shaded circles to show atoms
			Total	**9**	

Question			Expected Answers	Marks	Rationale
3	a	i	glycerol (1) + fatty acids (1)	2	either order **allow** 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	 **allow** it is a (dynamic) equilibrium **allow** 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: solid drying agent is added to product (1) the drying agent absorbs water from the product (1)	4	 **allow** named reagent eg distilled water **ignore** references to neutralisation **allow** named solid drying agent eg calcium chloride/sodium sulfate, **do not allow** calcium carbonate!
			Total	**8**	

Question			Expected Answers	Marks	Rationale
4	a	i	propene	1	**do not allow propane!**
		ii	area under the peak is largest/area under peak shows concentration	1	**allow** highest/widest/longest **ignore** 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 **allow** they have unreactive bonds = 1 mark only **ignore** 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	**allow** as alternative words exothermic = releases energy , endothermic = takes in energy marks can be scored from an annotated energy level diagram
			Total	**10**	

Question			Expected Answers	Marks	Rationale
5	a	i	use of 24, 16 and 1 in calculation but processed incorrectly (1) 58 (1)	2	**allow** first mark for calculations otherwise correct but missing out a step eg 2x1 or 2x16 **do not allow** first mark for totally incorrect calculation eg 24x16x1 **allow** 2 marks for correct answer without working
		ii	(40 x 23.5/1000 =) 0.94 g	1	
		iii	58 x 0.94/73 (1) = 0.75 g (1)	2	 **allow** 2 marks for correct answer without working **allow** 0.747 g/0.746 g **but not** 0.7 g or 0.8 g **allow** 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	**ignore** references to reliability (for first marking point) **allow** titration results are reliable
			Total	**7**	

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	**allow** named by-product: calcium chloride
	b		catalyst provides an alternative route for the reaction (1) with a lower activation energy (1)	2	**allow** reactants stick to catalyst surface (1) increases concentration of reactants (1) **allow** interaction with catalyst breaks/weakens bonds of reactants (1) allowing products to be formed faster (1) **ignore** references to collision rate or increased surface area
	c		$2C_2H_4 + O_2 \rightarrow 2(CH_2)_2O$	2	one mark for correct formulae, one mark for balance **allow** C_2H_4O for epoxyethane **allow** displayed formulae if correct balance mark can only be scored if formulae correct subscript numbers must be clearly subscript or no marks
			Total	**8**	

			Paper Total	**55**	

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
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	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

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

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553