

Chemistry A

General Certificate of Secondary Education

Unit **A322/02**: Modules C4, C5, C6 (Higher Tier)

Mark Scheme for January 2011

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by Examiners. It does not indicate the details of the discussions which took place at an Examiners' meeting before marking commenced.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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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, e.g. 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
<u>words</u>	= underlined words must be present in answer to score a mark
ecf	= error carried forward
AW/owtte	= alternative wording
ORA	= or reverse argument

e.g. 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.

The example below illustrates how to apply this principle to an objective question.

e.g. for a one mark question, where ticks in boxes 3 and 4 are required for the mark

Put ticks (✓) in the two correct boxes.

✓
✓

This would be worth zero marks.

Put ticks (✓) in the two correct boxes.

✓
✓

This would be worth one mark.

Put ticks (✓) in the two correct boxes.

✓
✓
✓
✓

This would be worth one mark.

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, e.g. 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, e.g. shading or crosses.

Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

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

Edinburgh	
Manchester	
Paris	
Southampton	

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

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

Question			Expected Answers	Marks	Additional Guidance
1	a	i	hydrogen (1) H ₂ (1)	[2]	do not allow H ² 2 should be subscripted or clearly smaller than H e.g. H ₂ / H ₂
		ii	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> rubidium hydroxide <input checked="" type="checkbox"/> (1)	[1]	
	b		<input type="checkbox"/> Elements further down the group ... <input checked="" type="checkbox"/> (1) The reaction produces more energy. <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/>	[2]	

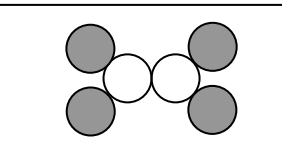
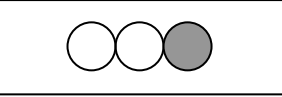
Question			Expected Answers	Marks	Additional Guidance
1	c	i	<p>any three from:</p> <p>(solution) goes purple/blue;</p> <p>gas is made / fizzing / bubbles;</p> <p>flash / explosion / flame;</p> <p>(flame is) purple/lilac;</p> <p>potassium moves around;</p> <p>floats / is on top of water;</p> <p>melts / forms a ball;</p> <p>it disappears / gets smaller;</p> <p>reaction is slower (than the other metals Gemma has used) / reaction is slower than caesium/rubidium / reaction is faster than sodium/lithium / faster than those above it / slower than those below it;</p>	[3]	<p>do not allow things that cannot be seen eg forms an alkali/hydrogen</p> <p>allow three correct marking points even if they are amongst some incorrect answers</p> <p>ignore hydrogen is made</p> <p>allow it will burn / it catches fire</p> <p>if say faster must be qualified eg by referring to sodium/lithium</p> <p>allow less violent/more violent, smaller explosion/bigger explosion, more reactive/less reactive instead of slower/faster</p>

Question			Expected Answers	Marks	Additional Guidance
1	c	ii	<p>any two from:</p> <p>identifies a specific hazard eg explosion / flame / something may spit out / glass bowl may break;</p> <p>produces a <u>corrosive</u> hydroxide/alkali/substance;</p> <p>identifies possible damage eg to skin/eyes;</p> <p>idea that safety screen is a barrier to prevent contact/protect from contact with material;</p>	[2]	<p>ignore something may hit you (not specific enough)</p> <p>ignore hazardous / dangerous / it gets on you</p> <p>ignore to prevent/protect from harm/injury unqualified</p>
			Total	[10]	

Question		Expected Answers	Marks	Additional Guidance															
2	a	<input type="checkbox"/> <input type="checkbox"/> ... different pattern of lines ... <input checked="" type="checkbox"/> (1) The lines can be compared ... <input checked="" type="checkbox"/> (1) <input type="checkbox"/>	[2]	apply list principle if more than 2 boxes are ticked															
	b	<table style="width: 100%; border: none;"> <thead> <tr> <th style="width: 70%;"></th> <th style="width: 15%; text-align: center;">true</th> <th style="width: 15%; text-align: center;">false</th> </tr> </thead> <tbody> <tr> <td>lithium atoms gain ...</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>lithium ions have a greater ...</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>lithium ion have fewer ...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>lithium atoms lose neutrons ...</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> </tbody> </table>		true	false	lithium atoms gain ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>	lithium ions have a greater ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>	lithium ion have fewer ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	lithium atoms lose neutrons ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>	[2]	all 4 correct = 2 marks 2 or 3 correct = 1 mark 1 correct = 0 marks if both boxes are ticked in any row, that row is incorrect ignore crosses if both crosses and ticks are shown allow crosses to represent choice if no ticks are shown.
	true	false																	
lithium atoms gain ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>																	
lithium ions have a greater ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>																	
lithium ion have fewer ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>																	
lithium atoms lose neutrons ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>																	
Total			[4]																

Question		Expected Answers	Marks	Additional Guidance	
3	a	MgCl_2 (<u>l</u>) \rightarrow Mg (<u>l</u>) + (<u>g</u>) (1) $(\text{MgCl}_2 \rightarrow \text{Mg} + \underline{\text{Cl}}_2$ (1)	[2]	state symbols (<u>l</u>) (<u>l</u>) and (g) for first mark. allow capitals (L) (L) and (G) formula Cl_2 for second mark. do not allow Cl^2 . do not allow CL_2 2 must be subscripted or clearly smaller than Cl e.g. Cl_2 / Cl_2	
	b	the magnesium ions gain electrons <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> a non-metal is made <input checked="" type="checkbox"/> (1)	[2]		
	c	i	142 g (1)	[1]	
		ii	12 tonnes (1)	[1]	
	d	i	(contains) ions; ions flow / move / <u>carry</u> charges / <u>carry</u> current;	[2]	ions move = 2 marks do not allow 'electrons move' allow ions carry electricity = 2 marks
		ii	electrons flow / move / <u>carry</u> charges / <u>carry</u> current (1) sea of electrons / delocalised (1)	[2]	note 'electrons are free to move' gets first marking point only allow 'metals contain 'free' electrons' as alternative wording for delocalised
Total				[10]	

Question		Expected Answers	Marks	Additional Guidance															
4	a	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;"></th> <th style="width: 10%; text-align: center;">true</th> <th style="width: 10%; text-align: center;">false</th> </tr> </thead> <tbody> <tr> <td>Some of these gases have ...</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>Molecules of these gases ...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>These gases conduct ...</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>These gases only contain ...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>		true	false	Some of these gases have ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Molecules of these gases ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	These gases conduct ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>	These gases only contain ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	[2]	<p>all 4 correct = 2 marks 2/3 correct = 1 mark 1 correct = 0 marks</p> <p>If both boxes are ticked in any row, that row is incorrect</p> <p>Ignore crosses if both crosses and ticks are shown. Allow crosses to represent choice if no ticks are shown.</p>
	true	false																	
Some of these gases have ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>																	
Molecules of these gases ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>																	
These gases conduct ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>																	
These gases only contain ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>																	
	b	below and below (1) molecular and weak (1)	[2]	allow wrong choice crossed out as indication for each pair															

Question	Expected Answers	Marks	Additional Guidance
4 c	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="display: flex; align-items: center; margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 5px; margin-right: 10px;">N_2O_4</div> <div style="border: 1px solid black; width: 120px; height: 40px; margin-right: 10px;"></div> <div style="border: 1px solid black; width: 120px; height: 40px; margin-right: 10px;"></div> <div style="border: 1px solid black; width: 120px; height: 40px; margin-right: 10px; text-align: center;">  </div> </div> <div style="display: flex; align-items: center; margin-bottom: 10px;"> <div style="border: 1px solid black; width: 120px; height: 40px; margin-right: 10px;"></div> <div style="border: 1px solid black; width: 120px; height: 40px; margin-right: 10px;"></div> </div> <div style="display: flex; align-items: center; margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 5px; margin-right: 10px;">N_2O</div> <div style="border: 1px solid black; width: 120px; height: 40px; margin-right: 10px;"></div> <div style="border: 1px solid black; width: 120px; height: 40px; margin-right: 10px; text-align: center;">  </div> </div> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; width: 120px; height: 40px; margin-right: 10px;"></div> <div style="border: 1px solid black; width: 120px; height: 40px;"></div> </div> </div>	[2]	<p>one mark for each correct line</p> <p>two lines to or from one box loses the mark for that box</p>
	Total	[6]	

Question		Expected Answers	Marks	Additional Guidance
5	a	<p style="text-align: right;"> <input type="checkbox"/> <input type="checkbox"/> pH probes do not rely on colour ... <input checked="" type="checkbox"/> (1) <input type="checkbox"/> </p>	[1]	
	b	<p>any three from: idea of repeats or averages; check to see if results are the same / close together; wash burette with solution to be used/vinegar; wash flask with distilled water; adding small amounts at a time / slowly / drop by drop; swirl/shake/stir/mix flask; Idea of carefully adding acid <u>near end point</u> / stop when colour has changed / when neutralised; read using meniscus;</p>	[3]	<p>allow to identify outliers / leave out 'different' results; ignore 'see if the results are different' (not enough)</p>
	c	i	40 (1)	[1]
		ii	60 (1)	[1]

Question		Expected Answers	Marks	Additional Guidance	
5	d	an equation for the reaction <input checked="" type="checkbox"/> <input type="checkbox"/> the concentration of the alkali used <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	[1]	both ticks required for one mark	
	e	i	cafe vinegar (1)	[1]	
		ii	50 g/dm ³ (1)	[1]	
Total			[9]		

Question			Expected Answers	Marks	Additional Guidance
6	a	i	copper sulfate (1)	[1]	<p>allow copper sulphate do not allow copper sulfide allow correct formula CuSO₄</p> <p>ignore carbon dioxide/CO₂ and water/H₂O if given as additional answers</p>
		ii	CO ₂ H ₂ O	[1]	<p>both required if three or more answers ringed no mark</p>
	b		<p>Particles collide less often in ...</p> <p style="text-align: center;"> <input type="checkbox"/> <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </p>	[1]	
Total				[3]	

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