



GCSE

Chemistry A

General Certificate of Secondary Education

Unit **A321/02**: Modules C1, C2, C3 (Higher Tier)

Mark Scheme for June 2012

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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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Annotations

Used in the detailed Mark Scheme:














Annotation	Meaning
/	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	credit alternative wording / or words to that effect
ORA	or reverse argument

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Available in scoris to annotate scripts:

	indicate uncertainty or ambiguity
	benefit of doubt
	contradiction
	incorrect response
	error carried forward
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
	no benefit of doubt
	reject
	correct response
	draw attention to particular part of candidate's response
	information omitted

Subject-specific Marking Instructions

- a. Accept any clear, unambiguous response (including mis-spellings of scientific terms if they are *phonetically* correct, but always check the guidance column for exclusions).
- b. 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.

e.g. for a one-mark question where ticks in the third and fourth boxes are required for the mark:

☐
☐
☒
☒
☐

*This would be worth
1 mark.*

☐
☐
☒
☒
☐

*This would be worth
0 marks.*

☒
☒
☒
☒
☐

*This would be worth
1 mark.*

- c. 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.

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d. Marking method for tick-box questions:

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 and other markings. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses. Credit should be given according to the instructions given in the guidance column for the question. 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 cities in England:

Edinburgh	<input type="checkbox"/>
Manchester	<input type="checkbox"/>
Paris	<input type="checkbox"/>
Southampton	<input type="checkbox"/>

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

- e. For answers marked by levels of response:
- Read through the whole answer from start to finish**
 - Decide the level** that **best fits** the answer – match the quality of the answer to the closest level descriptor
 - To determine the mark within the level**, consider the following:

Descriptor	Award mark
A good match to the level descriptor	The higher mark in the level
Just matches the level descriptor	The lower mark in the level

- iv. Use the **L1**, **L2**, **L3** annotations in Scoris to show your decision; do not use ticks.



Quality of Written Communication skills assessed in 6-mark extended writing questions include:

- appropriate use of correct scientific terms
- spelling, punctuation and grammar
- developing a structured, persuasive argument
- selecting and using evidence to support an argument
- considering different sides of a debate in a balanced way
- logical sequencing.

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Question			Answer	Marks	Guidance
1	(a)		<p>argon Ar (1)</p> <p>CO₂  (1)</p> <p>nitrogen N₂ (1)</p> <p>21  (1)</p>	4	each row completely correct for 1 mark formulae completely correct, numbers subscript diagrams need correct symbol from key
	(b)		<p>(8) 6</p> <p>0 0</p> <p>0 12</p> <p>16 6</p>	2	1 mark for each correctly completely column only award marks for completing columns allow 6 in equation only if top row left blank
	(c)		<p>nitrogen dioxide/nitrogen monoxide/nitrogen oxides (1)</p> <p>carbon monoxide (1)</p>	2	accept formulae if correct accept unburnt hydrocarbons / carbon particulates (1)
			Total	8	

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Question			Answer	Marks	Guidance
2	(a)		as the concentration of sulfur dioxide increases the pH decreases	1	ora ignore negative correlation
	(b)	(i)	works out a mean/average (even if incorrect) (1) misses out the outlier 3.4 (1) $26/5 = 5.2$ (1)	3	allow 3 marks for 5.2 without showing working allow 2 marks for 4.9 without showing working
		(ii)	<i>any two from:</i> wind blowing air around/change in wind direction/wind strength/ (1) nearby traffic could vary (1) output from a nearby power station/factories could vary (1) variation in measuring equipment/human error (1)	2	accept any reasonable answer related to possible sources ignore more/less rain ignore more/less SO ₂
			Total	6	

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Question			Answer	Marks	Guidance
3	(a)		Type 2 diabetes is caused by obesity.	1	
			There is a correlation between the percentage of men who are obese and the percentage of men who develop type 2 diabetes.		
			There is no connection between obesity and type 2 diabetes.		
			As the percentage of men who are obese increases the percentage of men with type 2 diabetes increases.		
	(b)		being obese increases the chance that a person will develop diabetes (1) AW but not all people who are obese will get diabetes (1) AW	2	
	(c)		The foods that are most likely to lead to obesity.	2	
			The chance of an obese person developing type 2 diabetes.		
			The other factors that may lead to the development of type 2 diabetes.		
			The likely effects of type 2 diabetes on a person's health and lifespan.		
			Other health issues that may arise from a person being obese.		
			How the percentage of people with type 2 diabetes compares with those with type 1 diabetes.		

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Question			Answer	Marks	Guidance										
	(d)		<table><tr><td>Some people may not be able to afford a healthy diet.</td><td>✓</td></tr><tr><td>The fact that obesity is a risk factor for diabetes has not been publicised enough.</td><td></td></tr><tr><td>Type 2 diabetes is not a serious illness.</td><td></td></tr><tr><td>Some people know the risk but choose to ignore it.</td><td>✓</td></tr><tr><td>The connection between lifestyle and obesity is not certain.</td><td></td></tr></table>	Some people may not be able to afford a healthy diet.	✓	The fact that obesity is a risk factor for diabetes has not been publicised enough.		Type 2 diabetes is not a serious illness.		Some people know the risk but choose to ignore it.	✓	The connection between lifestyle and obesity is not certain.		2	
Some people may not be able to afford a healthy diet.	✓														
The fact that obesity is a risk factor for diabetes has not been publicised enough.															
Type 2 diabetes is not a serious illness.															
Some people know the risk but choose to ignore it.	✓														
The connection between lifestyle and obesity is not certain.															
			Total	7											

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Question			Answer	Marks	Guidance												
4	(a)		(glass) acid rain caused by sulfur dioxide/NOx (1) more sulfur dioxide/NOx from glass manufacture (1) OR acid rain caused by carbon dioxide, sulfur dioxide and NOx (1) carbon dioxide causes acidity less than the other two (1) OR increased levels of NO _x leads to an increased possibility of smog(1) OR (polythene) carbon dioxide levels are higher and is linked to increased global warming/greenhouse effect(1)	2	accept reverse argument throughout answer must convey the idea of a comparison												
	(b)	(i)	for polythene $(4.7 + 2.2) \times 5 = 34.5(1)$ for glass $7.2 + (2.5 \times 5) = 19.7(1)$ energy difference $34.5 - 19.7 = 14.8 (1)$	3	allow ecf from correct subtraction of totals for glass/polythene (1)												
		(ii)	(in energy terms) (re-)using <u>glass</u> bottle is more sustainable (1) because less energy is needed to re-use/recycle/make new glass bottles (1) because more energy needed to make five polythene bottles (1) but energy needed to wash glass bottles is not taken into account (1)	2	ora												
		(iii)	<table><tr><td>The environmental impact of making the material.</td><td></td></tr><tr><td>The energy input for making the material.</td><td></td></tr><tr><td>The cost of disposal of the product.</td><td></td></tr><tr><td>The energy input for making the product.</td><td>✓</td></tr><tr><td>The environmental impact of using the product.</td><td></td></tr><tr><td>The energy input for using the product.</td><td>✓</td></tr></table>	The environmental impact of making the material.		The energy input for making the material.		The cost of disposal of the product.		The energy input for making the product.	✓	The environmental impact of using the product.		The energy input for using the product.	✓	2	
The environmental impact of making the material.																	
The energy input for making the material.																	
The cost of disposal of the product.																	
The energy input for making the product.	✓																
The environmental impact of using the product.																	
The energy input for using the product.	✓																
			Total	9													

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Question			Answer	Marks	Guidance
5	(a)		All chair legs are made with this length and thickness.	2	
			To see if the factor being investigated has an effect on the outcome all other factors must be kept constant.		
			They wanted to vary each factor in turn to see which has the most effect on the outcome.		
			The machine could only accept plastic samples of this size.		
			If another factor is varied this could change the results so that the effect of two types of plastic cannot be compared.		
			Using samples of another size would have changed all of the results.		
	(b)		The range of the results for the old plastic does not overlap with the range for the new plastic.	3	
			The ranges of the results for the old plastic and new plastic are both narrow.		
			The best estimate for the new plastic is 42kN higher than that for the old plastic.		
			The range of the results for the old plastic does not include the value 578.		
			The best estimate for the old plastic is not within the range of the new plastic.		
			Neither set of results contains an outlier.		
			Total	5	

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Question			Answer	Marks	Guidance
6	(a)		Metaldehyde helps to protect crops.	2	
			The European limit is set well below the level that could cause harm to people.		
			It is not possible for anything to be completely safe.		
			People do not drink very much water.		
	(b)		the benefit outweighs the risk (1) (the benefit is large) because it prevents crops from being damaged/higher yield of crop/better profit/ (1) (the risk is small) because the level that gets into the <u>water</u> is so low (1)	3	
	(c)		Colin (and) Faisal	2	allow any order
			Total	7	

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