GCSE

Chemistry A

General Certificate of Secondary Education

Unit **A171/01**: Modules C1, C2, C3 (Foundation Tier)

Mark Scheme for January 2012

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	alternative wording
ORA	or reverse argument

Available in scoris to annotate scripts

?	indicate uncertainty or ambiguity
BOD	benefit of doubt
CON	contradiction
✖	incorrect response
ECF	error carried forward
⬭	draw attention to particular part of candidate's response
NBOD	no benefit of doubt
R	reject
✔	correct response

L1 , L2 , L3	draw attention to particular part of candidate's response
∧	information omitted

Subject-specific Marking Instructions

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

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 boxes 3 and 4 are required for the mark:

Put ticks (✓) in the two correct boxes.

Put ticks (✓) in the two correct boxes.

Put ticks (✓) in the two correct boxes.

This would be worth 1 mark.

This would be worth 0 marks.

This would be worth 1 mark.

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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.

d.   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	✔	✘	✔	✔	✔				✔	
Paris				✔	✔		✔	✔	✔	
Southampton	✔	✘		✔		✔	✔		✔	
Score:	2	2	1	1	1	1	0	0	0	NR

e.   For answers marked by levels of response:
- i.   **Read through the whole answer from start to finish**
- ii.   **Decide the level** that **best fits** the answer – match the quality of the answer to the closest level descriptor
- iii.   **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

d.   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.

Question			Answer	Marks	Guidance
1	(a)		$100 - (1.00+78.00+20.80+0.10+0.05)$ (1) $= 0.05$ (1)	2	0.05 [2] answer in table is taken as candidate answer
	(b)	(i)	more cars (1) burning of fuel (produces carbon dioxide) (1)	2	**allow** buildings do not allow much air movement (1), so more carbon dioxide stays in town (1)
		(ii)	photosynthesis (1)	1	
	(c)		**first mark:** nitrogen (1) **any 2 from:** from air; (reacts with) oxygen; react at high temperature / react due to spark (2)	3	 **do not allow** air mark if any implication that nitrogen oxides come from fuel. **allow** mixes with oxygen
			Total	**8**	

Question			Answer	Marks	Guidance
2	(a)		increases / goes up (1)	1	
	(b)		**[Level 3]** Balance is for low confidence. Answer includes suggestions that will have an effect upon the confidence in the claim. Links each suggestion to the level of confidence. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Decision can favour high or low confidence. Answer includes some suggestions that affect the confidence in the claim with some idea of how they affect it. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Answer includes comments about what may affect the confidence in the claim. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to C** **Confidence is low because:** • correlation does not mean cause • there could be other causes • no peer review • so opinions of other scientists have not been given • explanation of why peer review important • no reproducibility of data • so this set of results may not be a 'one off' • journalist is not a scientist • journalist could be biased • so may have his/her own interpretation of data • data not repeated • so may not be reproducible • only one town has been investigated • data from other towns may disagree with this data • more evidence is needed **Claim may be correct because:** • there is a clear correlation • so asthma could be caused by particulates • points are all close to straight line • there are no anomalies/outliers • so conclusions from data will have some validity **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**

Question			Answer	Marks	Guidance
2	(c)	(i)	**first mark:** sulfur / sulfur compounds (1) **any 2 from:** (sulfur/sulfur compounds) in fuel; (reacts with) oxygen; during burning (2)	3	**do not allow** 'sulfur dioxide' for first mark only **allow** any named fossil fuel
		(ii)	oxygen (1) water (1)	2	
			Total	12	

Question			Answer	Marks	Guidance
3	(a)		measure the distance / measure how far it bends / starting point to measure from (1)	1	**allow** know / check etc for measure
	(b)	(i)	**different argument:** distance / idea that **amount** of bending would be different / higher mass would bend more (2) *or any 2 from:* results would be different; cannot calculate best estimate; results would not be reliable; results cannot be compared (2) **OR** **same argument:** *any 2 from:* same mass tests the bendiness of the ruler/polymer; same mass allows results to be compared; can calculate best estimate; results are reliable; only changing one variable (2)	2	**accept** would give outliers **ignore** references to accuracy
		(ii)	length / *l* / thickness / width (1)	1	**accept** size
	(c)	(i)	32 to 36 (1)	1	
		(ii)	works out mean/average as the best estimate (1) (34+32+34+35+33+36)/6 = 34 (1)	2	34 with no working = (2) answer which clearly shows 34 is the mode = (1)

Question			Answer	Marks	Guidance
3	(c)	(iii)	best estimate (very) likely to be true value (1)	2	
			because range is small (1)		**accept** 34 occurs twice in the results **ignore** median arguments

Question			Answer	Marks	Guidance
3	(d)		**[Level 3]** Answer correctly identifies one or more methods to increase polymer flexibility and explains how polymer chains behave on a molecular level. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Answer correctly identifies one or more methods to increase polymer flexibility and refers to the structure of polymers on a molecular level. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Answer correctly identifies how flexibility changes polymer properties or states a method for increasing flexibility but may not discuss the answer on a molecular level. Answer may be simplistic. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to C** **Indicative scientific points at Level 3 may include:** **Methods** • using plasticizers • reducing cross links • reducing chain length • description of how modifying the polymer affects its flexibility i.e. bendiness **Polymer structure** • polymers contain long chain molecules • plasticizer molecules get between polymer molecules • plasticizer molecules are small • polymer chains held together by forces **Behaviour of chains** • idea of molecules moving over each other • reduces strength of bonds/forces between polymer molecules • so that it is easier to pull polymer molecules apart/slide them over each other **accept** answers based on reducing crystallinity **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**15**	

Question			Answer	Marks	Guidance
4	(a)		use / control / production / alteration of properties (1) particles/structures that are **very** small/tiny / at molecular level / 10^{-9} m / one billionth of a metre (1)	2	use/control/production must be linked to nanotechnology idea must indicate very small particles not just small particles, or particles measured by a few nanometres (up to 100)
	(b)		stronger / harder to break (1)	1	**ignore** harder and stiffer / other properties
	(c)		<table><tr><td>Nanoparticles do not occur in nature.</td><td></td></tr><tr><td>Nanoparticles have a smaller surface area than larger particles.</td><td></td></tr><tr><td>The effects of nanoparticles have not yet been fully investigated.</td><td>✓</td></tr><tr><td>Nanoparticles are larger than 1000 nm.</td><td></td></tr><tr><td>Nanoparticles may be harmful to health.</td><td>✓</td></tr><tr><td>Nanoparticles are too small to be seen by the unaided eye.</td><td></td></tr></table>	2	one mark for each correct tick
			Total	**5**	

Question	Answer	Marks	Guidance
5 (a)	**[Level 3]** Answer addresses one or more rock features and relates this to how it was made. Suggest further evidence that could be found in the rock. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Answer links one or more features of the rock either to how it was made or to what further evidence to look for. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Answer gives a simple statement about a feature of the rock or how it was made but does not link ideas into an explanation. No further evidence is suggested. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to E** **Indicative scientific points may include:** Features of the rocks - shells - fossils - ripple marks / layers - sea creatures How the rock was made - sea - beach / sea shore - waves - sedimentary - in layers - pressure - under water / sea Further evidence - grains - layers - more fossils / different fossils/shells - fossils of plant material - soft / flaky - grains may be rounded **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**

Question			Answer	Marks	Guidance
5	(b)		coal (1) limestone (1)	2	
	(c)	(i)	Sulfuric acid is a strong acid that harms living things. [ ] Hydrogen chloride is an acidic gas that is very harmful. [✓] Sodium sulfate is a poisonous chemical. [ ] The carbon used was in the form of coke. [ ] Calcium sulfide is a solid waste that gives off poisonous hydrogen sulfide gas. [✓] Carbon dioxide is an acidic gas that is toxic. [ ]	2	one mark for each correct tick
		(ii)	hydrogen chloride (gas) / HCl (1)	1	**do not allow** hydrochloric acid / hydrogen chlorine formula must be completely correct
	(d)	(i)	**first mark:** idea of removing micro-organisms (1) **any 1 from:** (micro-organisms) are killed; which could cause disease / make you ill (1)	2	 **allow** bacteria / germs for micro-organisms **allow** correct named disease
		(ii)	The water may give off poisonous chlorine gas. [ ] Chlorine can react with organic materials to produce toxic chemicals. [✓] Chlorine reacts with water to form an acidic solution. [ ] Chlorine can react with and damage water pipes. [ ]	1	
			Total	**14**	

Question			Answer	Marks	Guidance
6	(a)		preservative / lasts longer / flavouring / tastes better (1)	1	
	(b)	(i)	breakfast 0.5 lunch 2.5 dinner 4.5 (1) **total** **7.5 (1)**	2	three first values correct (1) total (1) **allow** ecf for total if values are incorrect
		(ii)	<table><tr><td>More than the recommended daily intake.</td><td>✓</td></tr><tr><td>Equal to the recommended daily intake.</td><td></td></tr><tr><td>Less than the recommended daily intake.</td><td></td></tr></table>	1	
		(iii)	instead of/eat less chips / hamburger / pizza / baked beans (1) instead eat/eat more baked potato / green beans / fish (1)	2	**allow** food given in lists of meals **ignore** crisps
			Total	**6**	

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