OCR
Oxford Cambridge and RSA

GCSE

Chemistry A

Unit **A171/02**: Modules C1, C2, C3 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for June 2017

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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.

Annotations

Available in RM Assessor to annotate scripts:

BP	Blank Page – this annotation must be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
?	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	indicate level awarded for a question marked by level of response
^	information omitted
—	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

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
words	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

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 <u>and</u> 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.

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	
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**

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

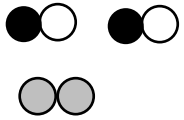
Just matches the level descriptor	The lower mark in the level

iv. Use the **L1**, **L2**, **L3** annotations in RM Assessor 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)		14-27(%);(1) Idea of gases total 73 /adding up 50 + 20 + 3 %;(1)	2	27 alone = 1 mark
	(b)		**[Level 3]** Description and explanation for the changes for water vapour and oxygen and explanations for carbon dioxide, from 4 billion years ago until today including changes over the last 500 years. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Description of the changes for two of the gases **AND** an explanation for these changes. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Description of the changes in some of the gases **OR** explanation for the change in one of the gases. 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 A** **Indicative scientific points may include:** **Descriptions** • oxygen has increased overall • carbon dioxide decreased overall • water vapour has decreased overall • quotes numbers • carbon dioxide small increase over last 500 years **Explanations** • carbon dioxide decreased due to photosynthesis • oxygen increased due to photosynthesis • water vapour condensed into the oceans • carbon dioxide dissolved in the oceans • carbon dioxide formed sedimentary rocks • carbon dioxide formed fossil fuels • carbon dioxide increased by human activity • carbon dioxide increased from burning of fossil fuels **ignore:** statements about changes in nitrogen **Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.**
			Total	8	

Question			Answer	Marks	Guidance
2	(a)	(i)	Nitrogen and oxygen (from air);(1) (react at) high temperature (inside engine);(1)	2	**Reject** any other gases **Reject** from the fuel **Ignore** heat
		(ii)	incomplete combustion;	1	**Accept:** not enough oxygen **Allow:** carbon <u>from the fuel</u> reacts with oxygen (from the air)
		(iii)	 Formula for CO correct ; (1) Formula for nitrogen correct ; (1) Correct balancing / 2CO shown; (1)	3	If atoms do not touch formula are incorrect Shading for C must be darker than shading for N. O must be unshaded.
	(b)		(Suzy correct) pollution decreases outside the charge area; (Martin correct) pollution decreases inside the area / after payment introduced; (decreases inside area) by more;	3	**Ignore** repeats of the stem 'decreases anyway'. **Ignore** numbers quoted from the table without processing. Comparison needed.
			Total	9	

Question	Answer	Marks	Guidance
3	**[Level 3]** States relationship between the size of molecules and boiling point. Explains the relationship in terms of forces between the molecules **and** the energy required to overcome these forces. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** States relationship between the size of molecules and boiling point. Links this to forces between molecules **or** the energy required to separate molecules. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Describes the trend in boiling points and links this to size of the molecules. 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 A/A*** **Indicative scientific points may include:** • The more carbons the higher the boiling point • The more carbons the larger the molecules. • larger molecules have higher boiling points • Larger molecules have larger / more forces between them • the larger / more the forces between the molecules the more energy is required for them to break out of a liquid and become a gas • the more energy needed to separate the molecules, the higher the boiling point of the hydrocarbon • the larger / more the forces between the molecules the higher the boiling point **Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.**
	Total	6	

Question	Answer	Marks	Guidance

<table>
<tr><td>4</td><td>(a)</td><td></td><td>1 to 100 nm;</td><td>1</td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td>
<table>
<tr><th>Sentence</th><th>True</th><th>False</th></tr>
<tr><td>….. to make sports equipment.</td><td>✓</td><td></td></tr>
<tr><td>….. can occur naturally.</td><td>✓</td><td></td></tr>
<tr><td>…..same properties as larger</td><td></td><td>✓</td></tr>
<tr><td>….. same size as some molecules.</td><td>✓</td><td></td></tr>
</table>
</td><td>2</td><td>All four correct = 2 marks
3 or 2 correct = 1 mark
1 or 0 correct = 0 mark</td></tr>
<tr><td></td><td>(c)</td><td></td><td>nanoparticle material is stronger/ nanoparticle material has antibacterial properties;

nanoparticles may be harmful to the body / nanoparticles not been fully investigated/ long term effects / unknown effects;

(Chooses either material) with idea of risks outweigh benefits or vice versa:</td><td>3</td><td>Ignore: may enter body / side effects / harmful to the environment / cost / harmful alone
Allow named long term effect eg cancer</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>6</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
5	(a)		length of shaft; force exerted / mass added; results will be different (for the same shaft) / affect the outcome(for the same shaft);	3	**Ignore** comments about wooden strip / temperature / clamped with same force Clamp in same place = length
	(b)	(i)	86+89+87+88+87 / 5 ; 87.4;	2	Correct answer with no working = 2 marks 87 with no working scores zero marks. 87 with correct processing = 2 marks
		(ii)	87.4/1000 = 0.0874 m; FR = $\frac{10}{3 \times 0.0874}$ = 38.1; Choice consistent with answer;	3	ecf from 5bi marking point 2 can be given without the mm to m conversion Numerical answer on point 2 should be consistent with numbers used. **Accept** any number of decimal places Choice without calculation= 0 marks
			Total	8	

Question			Answer	Marks	Guidance
6	(a)		Any two from: (salt was in) the sea /oceans / lakes; (sea) water evaporated (to leave salt deposits); covered by sediment;	2	
	(b)		due to tectonic plates; Idea of movement / drift (of salt deposits / land/ rock/ continents);	2	

	(c)		**[Level 3]** Chooses solution mining as the best method and justifies their choice by stating comparisons between both methods. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Makes statements stating comparisons between both methods. **OR** Chooses solution mining as the best method and makes a correct statement about either method. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Makes a correct statement about either method. **OR** Chooses solution mining as the best method without justification. 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 may include:** **Comparative statements** NB allow reverse argument for either approach. • Solution mining provides higher purity of salt • Solution mining is safer as there are no workers underground. • Solution mining uses larger amount of energy to heat the water. • Solution mining does not need purification methods. • Underground mining has issues with dust / traffic / other named environmental problems. **Other relevant statements** • Both processes cause subsidence. **Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.**
			Total	**10**	

Question			Answer	Marks	Guidance
7	(a)	(i)	Neutralising (acid) soil/used in dying process/making soap/making glass;	1	**Reject** they are dyes / soap
		(ii)	Urine;	1	**Accept:** lime(stone) / chalk / seaweed
	(b)	**(i)**	carbon dioxide ; calcium sulfide ;	2	
	(c)	**(ii)**	chlorine; kills micro-organisms / treats water / makes bleach;	2	**Allow** purifying water
			Total	6	

Question			Answer	Marks	Guidance
8	(a)		carbon chlorine hydrogen	2	3 correct = (2) 2 or 1 correct = (1)
	(b)	**(i)**	more flexible/less stiff;(1) any one from: plasticiser in between polymer chains; spreads chains / molecules apart; decreases forces between polymer chains;(1) allows chains / molecules to slide (past each other);(1)	3	**Ignore** other properties
		(ii)	<u>plasticisers</u> may leach /get out; food / drink harmful when consumed;	2	 MUST have the idea that food/drink is consumed **Allow** named harmful effect
			Total	7	

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