OCR
Oxford Cambridge and RSA

GCSE

Chemistry A

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

General Certificate of Secondary Education

Mark Scheme for June 2017

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

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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.

1. 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.

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>1</td><td>(a)</td><td></td><td>air
oxygen
high</td><td>2</td><td>3 correct = 2 marks
2 or 1 correct = 1 mark.</td></tr>
<tr><td></td><td>(b)</td><td></td><td><table><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td>NO is reduced to form nitrogen</td><td>✓</td></tr></table></td><td>1</td><td></td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>Fewer cars / more public transport used / more people walk / more bicycles used;

less fuel used / less (air) pollution;</td><td>2</td><td>

Allow less of a named pollutant produced e.g. nitrogen oxides</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>(Suzy correct) pollution decreases outside the charge area;
(Martin correct) pollution decreases inside the area /after payment introduced;

(decreases inside area) by more;</td><td>3</td><td>Ignore repeats of the stem ‘decreases anyway’.

Ignore numbers quoted from the table without processing.

Comparison needed.</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>8</td><td></td></tr>
</table>

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>2</td><td>(a)</td><td></td><td><table><tr><td>Sulfur in the fuel burns</td><td>✓</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table></td><td>1</td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td>oxygen;
water;</td><td>2</td><td>Either order.</td></tr>
<tr><td></td><td>(c)</td><td></td><td>[Level 3]
Describes in detail the variation in the downward trend and suggests reasons for the change in sulphur dioxide.
Quality of written communication does not impede communication of the science at this level.
(5 – 6 marks)
[Level 2]
Describes the overall downward trend AND suggests a reason for the change in sulphur dioxide emissions
OR
Describes in detail the variation in the downward trend.
Quality of written communication partly impedes communication of the science at this level.
(3 – 4 marks)
[Level 1]
Describes the overall downward trend
OR suggests a reason for the change in sulphur dioxide emissions.
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)</td><td>6</td><td>This question is targeted at grades up C

Indicative scientific points may include:
Detailed descriptions of variation
• Fluctuation from 1985 to 1992 (slower overall decrease)
• Faster rate of decrease 1992 to 1998.
• Slower decrease after 1998.
Reason for decreasing sulphur dioxide emissions
• Less cars are used so less fuel is burned.
• Sulfur removed from petrol / fuels before burning.
• Less fossil fuels in power stations /fewer power stations or using alternative methods of generating electricity, e.g. biofuels, wind etc.
• Using less electricity.
• Removing sulfur dioxide from flue gases.
• More electric cars / more public transport used / walking / more bicycles used.

Other points
• Graph used to quote values for downward trends or particular changes.

Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>9</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
3	(a)	(i)	carbon dioxide;	**1**	
		(ii)	oxygen ;	**1**	
		(iii)	(78%) nitrogen (1%) argon	**2**	
			Total	**4**	

Question			Answer	Marks	Guidance
4	(a)		gas; liquid;	2	
	(b)		**[Level 3]** Describes the trend in some properties from the table with the size of the molecule or number of carbon atoms including an anomaly. **OR** Describes the trend in some properties from the table with the size of the molecule or number of carbon atoms including a property not in the table. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Describes the trend in some properties from the table with the size of the molecule or number of carbon atoms. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Describes the trend in a property with the size of the molecule or number of carbon atoms. 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 E** **Indicative scientific points may include:** **Description of properties in the table** • boiling points increase as no of carbons increases • melting points increase as no of carbons increases • densities increase as no of carbons increases • physical state changes from gas to solid. **Description of properties not in the table** • Viscosity increases as no of carbons increase • Volatility decreases as no of carbons increases • Flammability decreases as no of carbons increases **Identification of anomaly** • decrease in melting point between methane to ethane and ethane to propane • decrease in density between ethane and propane Ignore comments made about incorrect choices of state from Q4a QWC is impeded if candidate discusses the number of (carbon) molecules increasing rather than number of carbon atoms. **Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.**
			Total	8	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>5</td><td>(a)</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>…..about the same size as molecules.</td><td>✓</td><td></td></tr>
</table>
</td><td>2</td><td>4 or 3 correct = 2 marks
2 or 1 correct = 1 mark</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>nanoparticle material is stronger/ has antibacterial properties;</td><td>1</td><td>Ignore ideas about speeding up the healing process.
Ignore ‘kills germs’</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>nanoparticles may be harmful to the body / not been fully investigated / long term effects are not known;</td><td>1</td><td>Accept ideas about allergies as an alternative to harmful.</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>benefit outweighs the risk;</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>5</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
6	(a)		Chris measures the length of the shaft from one end to the other with a ruler/ tape measure / scaled device (to keep it the same); to compare the clubs ;	2	**Allow** ideas of measuring the length against the **wooden strip overhang.** **Allow** 'fair test' or a description
	(b)	(i)	Check they give similar values each time / range of results is small;	1	
		(ii)	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
		(iii)	FR = $\frac{10{,}000}{3 \times 87.4}$; =38.1; (Is suitable) because close to 38 / between 38 and 39 / in the range needed by the manufacturer / (is not suitable) because value is different;	3	Allow ecf from Q6b(ii) Correct response of 38.1 / 38 without working scores 2 marks Comment must refer to their calculated value.
			Total	8	

Question			Answer	Marks	Guidance
7	(a)	(i)	<table><tr><td></td><td></td></tr><tr><td>.. has ripples</td><td>✓</td></tr><tr><td></td><td></td></tr><tr><td>… pieces of shell</td><td>✓</td></tr><tr><td></td><td></td></tr></table>	2	
		(ii)	Tectonic plates moved / continental drift;	1	**Allow** continents have moved / crust moved / convection currents **in the mantle** **Ignore** references to volcanoes and sea floor spreading

7	(b)		**[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	9	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>8</td><td>(a)</td><td>(i)</td><td>
<table>
<tr><th>Statement</th><th>True</th><th>False</th></tr>
<tr><td>Alkalis were made from burnt wood and urine.</td><td>✓</td><td></td></tr>
<tr><td>Alkalis were made from acids.</td><td></td><td>✓</td></tr>
<tr><td>Alkalis were used to make soaps and dyes.</td><td>✓</td><td></td></tr>
<tr><td>Alkalis were used as food flavourings.</td><td></td><td>✓</td></tr>
</table>
</td><td>2</td><td>All correct (2)
2 or 3 correct (1)</td></tr>
<tr><td></td><td>(b)</td><td></td><td>(yes because)
hydrogen chloride is identified as a toxic gas;
water is identified as harmless;
chlorine is identified as a substance that can be used to stop the spread of disease;</td><td>3</td><td>Allow correct formulae

Ignore ‘chlorine is a toxic gas.’</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>5</td><td></td></tr>
</table>

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>9</td><td>(a)</td><td></td><td>chlorine</td><td>1</td><td></td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>
<table>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>….. more flexible</td><td>✓</td></tr>
<tr><td></td><td></td></tr>
</table>
</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>plasticisers get into water;
plasticisers can be harmful when drunk;</td><td>2</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>4</td><td></td></tr>
</table>

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