OCR
Oxford Cambridge and RSA

GCSE

Chemistry A

Unit **A173/01**: Module C7 (Foundation 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

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

Available in RM Assessor 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

	indicate uncertainty or ambiguity
BOD	benefit of doubt
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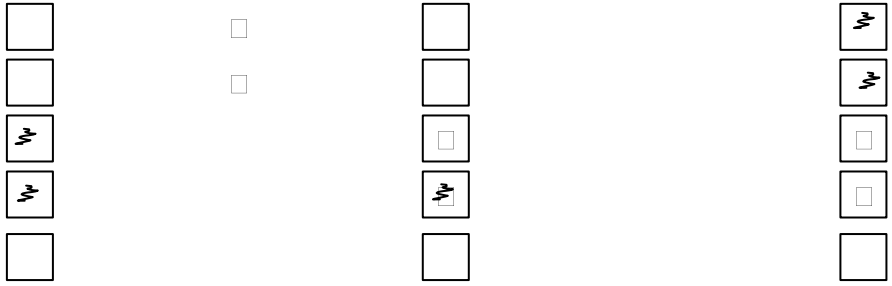
Subject-specific Marking Instructions

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

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.

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.

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 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**

For answers marked by levels of response:

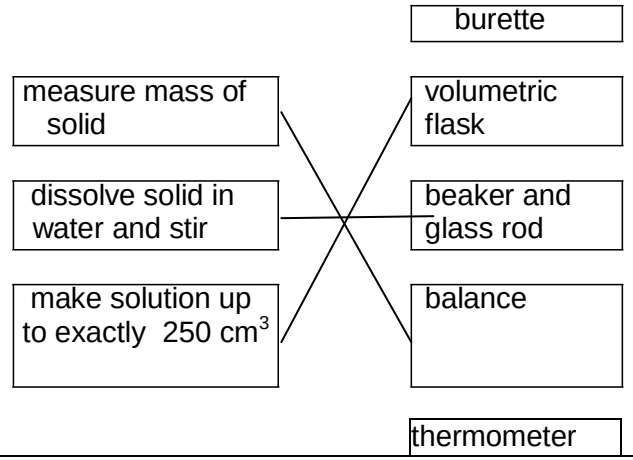
i. **Read through the whole answer from start to finish**
ii. **Decide the level** that **best fits** the answer – match the quality of the answer to the closest level descriptor
iii. **To determine the mark within the level**, consider the following:

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)		**stage needed** / **equipment**  	3	(1) for each correct line. If more than one line either to or from a box, that box does not 'count'.

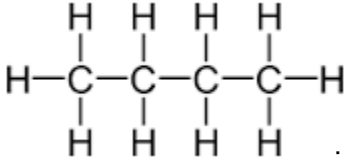
Question	Answer	Marks	Guidance
1 b	**[Level 3]** Makes statements about sampling, storing and handling and making solutions. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Makes a statement about two different aspects of the procedure. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Makes a basic statement about one aspect of the procedure. 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 D** **Indicative scientific points may include: Level 3 (Accuracy)** **Level 2 and 3 (Use of equipment)** **Sampling** • random sampling/ spread of samples • idea of different times during the day • regular spacing of times • more than one sample at each time • idea of taking lots of samples to take a mean value **Storing and Handling** • using containers for different tablets • idea of keeping samples separate / not mixing up • labels on samples • not contaminating / wear gloves / make sure equipment is clean • separate glassware/equipment **Making solutions** • control of volume or amount of water/ total volume or amount of solution • control of number/amount of tablets (used to make solution) • idea of not contaminating glassware / using clean equipment. **Allow** 'repeat' idea for L1 (1) mark as evidence of partial engagement with science **Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.**

Question			Answer	Marks	Guidance
1	(c)		sodium chloride ; (1) CO_2; (1)	2	
1		ii	reacts with/ neutralises (hydrochloric) acid/HCl ; (1) Carbon dioxide/CO2 quoted as the product; (1)	2	 Do not allow second marking point if other products are listed
			Total	13	

Question			Answer	Marks	Guidance
2	(a)	(i)	*Any 2 from:* Range is wide/ results vary ; Identifies range 8.0 / 19.0 to 27 ; 19.0/ result 4 is an outlier ; Rough reading should be above accurate ;	2	**Alternatives to first point** results not concordant/consistent/repeatable/ values are quite far away from each other / fluctuates too much/ there is a range **Ignore** reliable outlier must be identified
	(ii)		a pipette	1	
	(b)	**(i)**	21.0 20.5 21.5	1	All three needed
	(ii)		21(.0) (2 marks) For (1) mark adds ringed values ; (1)	2	**Allow** ecf on three ringed values from (b) (i) for (2) marks **Allow** 22.2 / 22(.0) for (1) mark (includes all five or last four in average)
	(c)		concentration is 4% ; (1) which is too low / below 5 % / different to 5% / best estimate/it should be 25.0; (1)	2	 **Ignore** ‘different’ alone
			Total	8	

Question	Answer	Marks	Guidance
3	**[Level 3]** Makes statement about a similarity and a difference to include activation energy and energy change of reaction. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Gives a similarity and a difference between the two diagrams. OR Gives differences or similarities between the two diagrams. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Makes a statement about a similarity or a difference between the diagrams. 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:** **Similarities** • energy given out when hydrogen burns is the same as the energy taken in when it forms. • Both reactions involve hydrogen, oxygen and water • the energy of water OR hydrogen and oxygen is the same in both reactions **Differences** • making has larger activation energy / burning has smaller • making endothermic • burning exothermic • making energy needed/taken in • burning energy given out • energy change of reaction is in different direction/opposite. **Allow** 'energy decreases when burning hydrogen and increases when making hydrogen' If activation energy point is made but 'activation' is omitted, consider QWC impeded **e,g,** 'larger amount of energy needed/ t aken in' for making hydrogen **Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.**
		6	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>4</td><td>(a)</td><td>(i)</td><td>C_{10} ; (1)

H_{22} ; (1)</td><td>2</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td><table><tr><td></td><td>true</td><td>false</td></tr><tr><td>decane has a higher relative formula mass than octane</td><td></td><td></td></tr><tr><td>both molecules contain double bonds</td><td></td><td></td></tr><tr><td>both molecules are hydrocarbons</td><td></td><td></td></tr><tr><td>both molecules give off carbon dioxide gas when they burn</td><td></td><td></td></tr></table></td><td>3</td><td>all correct (3)
3 correct (2)
1/2 correct (1)</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>  ; (1)

butane ; (1)</td><td>2</td><td>NO ecf on the name

All bonds and hydrogen atoms should be shown</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>7</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
5	(a)		reversible;	1	
	(b)		*any 2 from:* does not all react / so all ethene is used ; to avoid waste idea / saves resources / crude oil / sustainable; to increase yield / to make more ethanol ;	2	**Ignore** 'to use it again' **Ignore** atom economy / saves energy ; **Allow** 'no waste' **Allow** saves fossil fuel (crude oil)
	(c)		*Any 2 from :* high temperature ; high pressure; catalyst;	2	**Allow** 'optimum' temperature
	(d)		cools / goes into cooler ; condenses ;	2	
	(e)		fermentation of sugar ☐ using genetically modified bacteria on biomass ☐ in the Haber process using gas ☐ chromatography ☐ by titration ☐	2	
			Total	9	

Question	Answer	Marks	Guidance
6	**[Level 3]** Gives a benefit and risk and makes a statement about the data. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Gives a benefit or risk and makes a statement about the data. OR gives a benefit and a risk without clear reference to data. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Makes a statement about risk, benefit or data. 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: Risks** • methane and/or octane may be too/very flammable / cause a fire risk • gas can escape/difficult to store **Benefits** • liquid fuels/heptane/decane easier to carry or store as fuel / less likely to leak / can see leaks easily ORA • ignites/burns in cold (weather) • liquid fuels/decane/octane easy to carry/store as fuel / less likely to leak / can see/deal with leaks easily • compares energy output from 2 fuels • decane gives out the most energy when burned. **Data** • methane is a gas / heptane and/or decane/octane are liquids • methane has the lowest flashpoint / decane has the highest flashpoint / methane/octane ignites/burns easily / flammable /decane does not ignite/burn easily • methane and/or octane have flashpoints below room temperature / decane has a flashpoint above room temperature. • decane is less of a fire risk • methane gives out the least energy when burned **Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.**
		6	

Question			Answer	Marks	Guidance
7	(a)		old process has a waste (product)/ sodium sulfite ; (1) new process has no waste (product) / all products are useful ; (1)	2	Ignore statements about yield Ignore '*less* waste' Ignore 'all the atoms are used'
	(b)		*any 3 from:* higher yield ; higher atom economy ; does not have any waste (products) / only by-products / all products useful ; (waste from older process) toxic/harmful ; needs less/fewer raw materials/ does not use sulfuric acid/ sodium hydroxide	3	ignore statements about energy "releases no harmful by-products" is this last point only [it may be releasing other by-products, but none of them are harmful]
	(c)	**i**	using renewable raw materials ☐ using a higher temperature and pressure ☐ finding more uses for phenol ☐ finding ways to increase the yield of phenol ☐	2	

	(d)	**ii**	to make sure that other scientists do not take credit for their work ☐ to reduce the safety risks during their experiments ☐ so that other scientists can check their data ☐ so that they can discuss their conclusions ☐ to stop other scientists from working on the same idea ☐			**2**	
	(d)			adv	disadv	**2**	All correct (2) 2 or 3 correct (1)
			enzymes speed up reactions	☐			
			reactions with enzymes can work at a lower temperature	☐			
			enzymes only work in narrow ranges of pH and temperature		☐		
			enzymes can be denatured		☐		
					Total	**11**	

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