OCR
Oxford Cambridge and RSA

GCSE

Chemistry A

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

General Certificate of Secondary Education

Mark Scheme for June 2016

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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

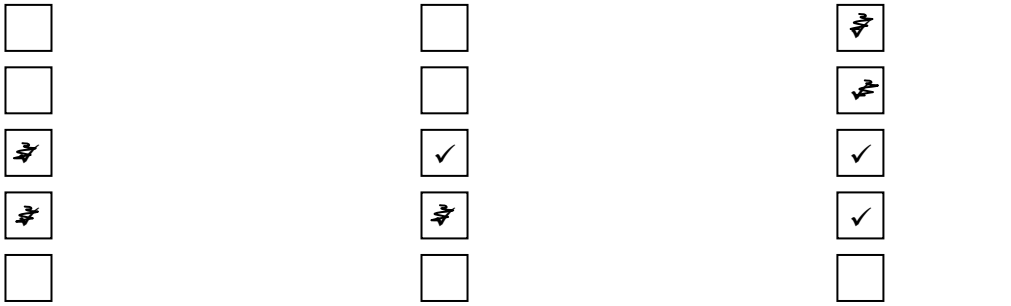
L1 , L2 , L3	draw attention to particular part of candidate's response
^	information omitted

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		⇌ ; (1)	1	**Do not accept** ↔ or ⇆
	b		High temperature (box 1) Using a catalyst (box 2) High pressure (box 4)	2	All 3 correct = (2) 2 correct = (1)
			Total	3	

Question			Answer	Marks	Guidance
2	a		The conditions….(box 2); (1) Yeast uses sugar… (box 4); (1)	2	
	b		The alcohol stops…(box 1); (1)	1	
	c		distillation; (1)	1	
			Total	4	

Question			Answer	Marks	Guidance
3	a	i	idea that bulk are made in large scale processes / made by a continuous process / idea of very large masses e.g. tonnes; (1) fine are made in small scale processes / made by batch processes / idea of smaller quantities e.g. kg; (1)	2	**Accept**: large amounts = bulk / small amounts = fine for (1) mark only **Accept** idea that bulk is much larger (clear comparison) for (2)
		ii	fertilisers are used on fields so not important that they are very pure / drugs are used on people or animals so must be very pure; impurities/drugs may be harmful / idea of health and safety issues;	any 2	**Accept** 'not safe' 'risk' 'cause harm' **Ignore** 'dangerous' 'it will kill you' 'side effects' **Ignore** references to fertilisers or bulk chemicals causing harm
		iii	Choosing feedstock (Box 1); (1) Choosing the best reaction conditions (Box 3); (1)	2	

Question			Answer	Marks	Guidance
	b		**[Level 3]** Discusses the use of methane, energy and the reaction linked to sustainability. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Identifies aspects of the process that affect sustainability with clear links. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Makes a statement to link one aspect of the process to sustainability. 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:** **Sustainability links about using methane** • methane comes from a fossil fuel • methane is in finite supply/will run out / is non-renewable **Sustainability links about energy** • multi-stage processes use more energy • high temperature uses energy • high temperature uses fuel/methane • methane/fossil fuel is burned to heat process / provide energy **Sustainability links about the reaction** • waste product/CO_2 [accept CO_2 from burning methane/] causes climate change (**Ignore** pollutant/harms the environment) • atom economy low/ 'only' 15% **BOD** references to 'atom efficiency' but ignore 'efficiency' alone **Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.**

Question			Answer	Marks	Guidance
	c	i	oxygen (1)	1	**Ignore** O_2
		ii	….lowers the activation energy (box 2); (1) … provides a different route (box 3); (1)	2	
			Total	15	

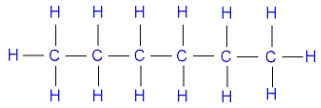
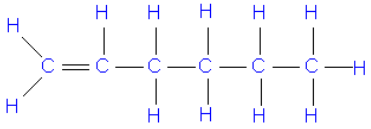
Question			Answer	Marks	Guidance
4	a		**[Level 3]** Makes correct statements about energy and size of atoms. **AND** Identifies, with a reason, that fluorine does not fit the pattern. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Makes correct statements about energy and size of atoms. **OR** Identifies, with a reason, that fluorine does not fit the pattern. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Makes a statement about energy or size of atom. 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:** **Statements about energy and size of atoms** • chlorine needs most energy to break bond • iodine needs least energy to break bond • compares energy needed to break bonds for two atoms. • the bond energy decreases (down the group) • compares size of two atoms • fluorine is smallest atom • iodine is largest atom • the radius increases (down the group) • (generally) as the atoms get larger/radius increases, bond energies get smaller. **Ignore** 'the bigger the atom, the weaker the bonds (in the question) **Fluorine does not fit…** • because bond energy for fluorine is lower than expected / lower than rest of pattern / lower than chlorine/bromine • because bond energy of fluorine is similar to bond energy of iodine **Accept** 'stonger' for more energy and 'weaker' for less energy throughout **Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.**

Question			Answer	Marks	Guidance
4	b	i	B	1	
		ii	break taken in given out less	3	All four correct (3) 3 correct (2) 1 or 2 correct (1)
			Total	10	

Question			Answer	Marks	Guidance
5	a	i	24.4-24.6; (1) 25.0-27.7; (1)	2	**Accept:** 24.6-24.4; **Accept:** 27.7-25.0; **Accept** 25 instead of 25.0
		ii	Acid A no more repeats AND acid B needs more repeats; (1) Acid B range is large / results are not concordant / not consistent / not repeatable/ results vary OR Acid A results are close together / AW ; (1)	2	**Allow** Acid A 'No' AND Acid B 'Yes' for 1 mark **Accept** ''Acid B results not reliable'' **Ignore** "Acid B results not accurate'' **Ignore** "Acid B results contain outliers'' **Ignore** "because of the range"
	b		add water (to the cleaning product and stir (with the glass rod); idea of dissolve/make a solution in the beaker; transfer to (volumetric) flask; make sure all solid is transferred/ rinse beaker into flask; fill up to line; shake thoroughly to mix:	any 4	 **Ignore** 'make a solution' alone (repeats question)
			Total	8	

Question			Answer	Marks	Guidance
6	a		**[Level 3]** Makes statements about the safety of all three sweets AND makes conclusions about the dyes in all three sweets. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Makes statements about the safety of at least two sweets OR makes conclusions about the dyes in two sweets. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Makes a correct statement about the safety of one of the sweets OR dyes in one of the sweets. 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:** **Dyes in the sweets** • sweet 1 contains 2 (safe) dyes • sweet 2 contains 2 dyes/safe dye 1 and unsafe dye • sweet 1 and 2 contain one dye that is the same in both sweets • sweet 3 contains one dye • sweet 3 contains an unknown dye/can't tell **Safety of the sweets** • sweet 1 contains (only) safe dyes / is safe • sweet 2 also contains the unsafe dye / is unsafe • sweet 3 may be unsafe / need more information **Ignore** 'makes spots' look for references to dyes or colours. **Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.**

Question			Answer	Marks	Guidance
6	b		distance travelled by spot; (1) distance travelled by solvent; (1)	2	
	c		To see the spots (box 3)	1	
	d	i	Dye C has the highest peak (box 1)	1	
		ii	(qualitative because) can show which dyes are used; (1) (quantitative because) can show how much of each dye is used; (1)	2	**Allow (1) only** for '(quantitative because) shows how many dyes are used.' **Ignore** statements about retention time or recorder response. 'shows which dyes are used and how much' = (2)
			Total	12	

Question			Answer	Marks	Guidance
7	a		CH_4 ethane propane C_4H_{10}	3	All 4 correct (3) 2 or 3 correct (2) 1 correct (1)
	b	i	***2 max from:*** **Similarities** all contain C; each carbon atom forms 4 bonds; All contain H; each hydrogen atom forms 1 bond; **difference** alkanes only single bonds / are saturated; alkenes contain double bonds / are unsaturated;	any 3	Can only score 3 marks by giving 2 similarities **and** identifying that alkenes contain a double bond. **Accept** alkenes contain fewer hydrogen atoms / compares general formulae; **Ignore** 'different numbers of hydrogen atoms'
		ii	 (1)  (1)	2	
			Total	8	

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