OCR
Oxford Cambridge and RSA

Cambridge National

Science

Unit **R075/01:** How Scientific Data is Used

Level 1

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.

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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

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 <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.

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	i	Change in colour (of indicator)	1	
		ii	21.0 ☐ 20.5 ✓ 20.6 ✓ 20.9 ☐ 20.4 ✓	1	All three ticks needed for (1)
		iii	Correct answer 20.5 ; (2) 20.4 + 20.5 + 20.6 OR idea of dividing by 3 ; (1)	2	**Allow** ecf from ii
		iv	(in table) 39.1 ; 20.4 ; 18.7 ;	3	 **Allow** ecf

Question			Answer	Marks	Guidance
1	b		**[Level 3]** Uses data to explain decisions about safety for all vinegars. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Makes a statement about all five vinegars without justification **OR** correct statement for at least two with justification. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Makes a statement about the safety of at least two vinegars **OR** correct statement for one with 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 D** **Indicative scientific points may include:** **Use of data** • A and/or B have concentrations too low to be safe / below 4% • A and B use less sodium hydroxide than the 4% vinegar / have lower titration values than the 4% / use less than 20.0 cm^3 • C and/or D have the correct concentrations / between 4 and 6% • C and D use sodium hydroxide between the 4% and 6% vinegars / have titration values between the 4% and 6% /between 20.0 and 30.0 cm^3 • E has concentration too high to be safe / above 6% • D uses more sodium hydroxide than the 6% vinegar / has higher titration value than the 6% / uses more than 30.0 cm^3 **Safety (may be intrinsic in answer if data used)** • A/ B not safe • C/D safe • E not safe **Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.**
			Total	**13**	

Question			Answer	Marks	Guidance
2	a	i	sulfate	1	
		ii	sulfate and chloride	1	Both needed
		iii	(test tube tests) no carbonate ions ; (ion chromatography) contains bromide ions ;	2	**Ignore** no reaction **Allow** gives information about relative amount of each anion **Ignore** reference to conductivity and retention time
	b		gives information about amounts ✓ can be used to test many different samples automatic. gives results by colour	1	
			Total	5	

Question			Answer	Marks	Guidance
3	a	i	idea that solutions get mixed up / contaminated ; wash/clean between readings ;	2	
		ii	*Any 2 from:* accuracy / more accurate / automatic / gives a number / gives a reading automatically ; to decimal places / not just a whole number / can show small differences in pH ; don't need to compare colours / no need for a chart;	2	**Allow** more sensitive **Ignore** reliable / easy to use **Allow** more precise **Allow** can reuse
	b		on the internet / use other people's work / data book ;	1	
	c		flame tests ✓ adding dilute sodium hydroxide ✓ titration colorimetry	2	
			Total	7	

Question			Answer	Marks	Guidance
4	(a)		sample from each place	1	**Ignore** different places
	(b)	(i)	Any **two** from: quick / no training needed / no preparation of specimen; easy to use; easy to move; large field of view;	2	**Allow** cheaper
		(ii)	greater magnification / see bigger image/more detail	1	
		(iii	3/50 (1); 0.06 (1)	2	correct answer without working gets 2 marks
	(c)	(i)	A (1st answer)	1	
		(ii)	C (3rd answer)	1	
		(iii)	(emerald and dioptase are) same shape	1	**Ignore** look similar
			Total	9	

Question			Answer	Marks	Guidance
5	(a)	(i)	all have spot same place/Rf value as phenylalanine	1	
		(ii)	0.59	1	**Allow** 0.56 – 0.62 **Do not allow** 0.6
		(iii)	Y (1); tyrosine (1)	2	
	(b)		histidine (3rd answer)	1	
	(c)		Put the chromatography..further into the solvent. ☐ Use more of the same solvent. ☐ Use a different solvent. √	1	
	(d)		Make his conclusion more secure / more reliable / get same result	1	**Ignore** accurate
			Total	7	

Question			Answer	Marks	Guidance
6	(a)	(i)	…. known concentrations √ …. unknown concentrations ☐ Different volumes …….. ☐	1	
	(b)		Dissolve every … √ Measure the absorbance…. ☐ Use a new filter…… ☐	1	

Question			Answer	Marks	Guidance
6	(c)		**[Level 3]** Correctly comments on both packets using mean and range with supporting data. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Correctly comments on one packet using mean and range with supporting data **OR** correctly comments on both packets using only mean and supported by data. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Correctly comments on comparison of quality of packets with no supporting 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 D** **Indicative scientific points may include:** **Packet A:** • mean gives conc 0.48 • suitable as <0.5 • range gives conc 0.40 to 0.56 • not suitable • part of range >0.5 **Packet B:** • mean gives conc 0.28 • suitable as <0.5 • range gives conc 0.20 to 0.36 • all suitable as <0.5 **Quality comparison:** • B contains less salicylic acid (ORA) • mean and range of B lower than A **Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.**

Question			Answer	Marks	Guidance
6	(d)		flame testing ☐ spectrophotometry √ electron microscopy ☐ gas chromatography ☐	1	
			Total	**9**	

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

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Head office
Telephone: 01223 552552
Facsimile: 01223 552553

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