OCR
Oxford Cambridge and RSA

Cambridge Technicals
Applied Science

Unit 3: Scientific Analysis and Reporting

Level 3 Cambridge Technical in Applied Science
05847 – 05849/05874/05879

Mark Scheme for June 2019

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.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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.

Annotations available in RM Assessor

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
	Benefit of doubt given
	Contradiction
	Rounding error
	Error in number of significant figures
	Error carried forward
	Level 1
	Level 2
	Level 3
	Benefit of doubt not given
	Noted but no credit given
	Ignore

Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
( )	Words which are not essential to gain credit
__	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

Subject-specific Marking Instructions

INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

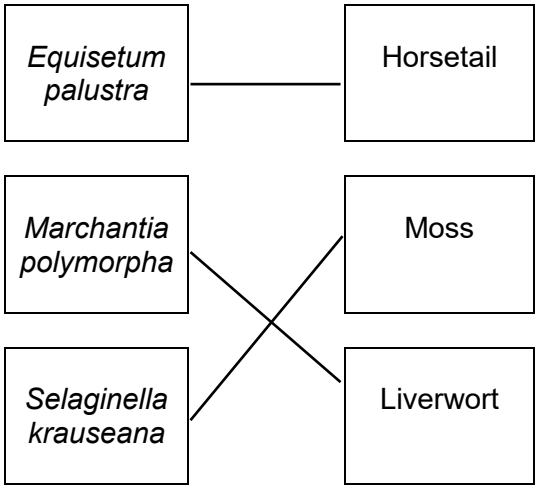
You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

Question			Answer	Marks	Guidance
1	(a)		92 ✓	1	
	(b)		92 ✓	1	
	(c)		**FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 95 award 2 marks** 1042 ÷ 11 ✓ = 95 (2sf)✓	2	 **ALLOW** 94.72 **ALLOW** any calculated value given to 2sf.
	(d)		**FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 9.3 award 6 marks** 11 correct x-mean values $x_i - \bar{x}$ ✓ 11 correct (x-mean)^2 values $(x_i - \bar{x})^2$ ✓ $\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \bar{x})^2$ / 867 ✓ 1/N-1 x [sum of (x-mean)^2] - taking mean as 95 = 86.7 ✓ √86.7 ✓ = 9.3 ✓	6	**ALLOW ECF** from mean calculated in 1(c)
	(e)	(i)	104.3 ✓	1	**ALLOW ECF** from 1 (c) and 1(d)
		(ii)	85.7 ✓	1	**ALLOW ECF** from 1(c) and 1(d)
		(iii)	**FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 63.6(%) award 2 marks** 7 out of 11 measurements are within the range ✓ 7÷11= 63.6(%) ✓	2	 **ALLOW** 64%

Question			Answer	Marks	Guidance
	(f)		**FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 3 x 10^{11} award 2 marks** 300,000 x 1 x10^6 ✓ = 3 x 10^{11} ✓	2	**ALLOW** 300 x10^9 etc
			Total	**16**	

Question			Answer	Marks	Guidance
2	(a)		x-axis = time of day/h **and** y-axis = sugar concentration (% of dry leaf mass) ✓ appropriate scale ✓ all points to ½ sq. ✓ appropriate best curve of best fit ✓	4	OWTTE
	(b)		1.2 ✓	1	**ALLOW** correct value for graph drawn +/- 0.5
	(c)		0.63 ✓	1	**ALLOW** correct value for curve drawn +/- 0.5
	(d)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 0.15 %/h award 4 marks** suitable tangent ✓ dy/dx ✓ = 0.15 ✓ units = %/h ✓	4	 **ALLOW** +/- 0.02 **ALLOW** % mass/h
		(ii)	increases ✓	1	
		(iii)	decreases (to zero) ✓	1	
			Total	**12**	

Question			Answer	Marks	Guidance
3	(a)		**Left side of key** hollow seeds/hollow ✓ 120cm plant height ✓ 90cm plant height ✓ **Right side of key** spore-forming / spore ✓ roots absent / no roots ✓ fine grooves in stems / fine grooves ✓ no true leaves ✓	7	
	(b)	(i)	 ✓✓	2	2 or 3 correct lines = 2 marks 1 correct line = 1 mark
		(ii)	**Any one from:** plant samples ✓ DNA nucleotide sequencing ✓ (scale) drawings/diagrams (drawn first hand) ✓	1	

Question			Answer	Marks	Guidance
	(c)	(i)	(Identifies) genus ✓ (Identifies) species ✓	2	**ALLOW** one mark for two-part name
		(ii)	**Any four from:** gives (plant/organism) a formal name ✓ unique identification/genus and species (for each type of plant) ✓ agreed code of rules ✓ (Latin names) internationally recognised/used ✓ shows phylogenetic relationships/more closely related species are placed within same genus ✓	4	**ALLOW** avoids confusion from same plant being known by different names **ALLOW** avoids confusion from same name being used (in different regions) to identify different plants **ALLOW** describes features of plant
			Total	**16**	

Question			Answer	Marks	Guidance
4	(a)		D ✓ B ✓ A ✓ C ✓	4	
	(b)		**FIRST CHECK THE ANSWER ON THE ANSWER LINES If answers = 9.0 award 2 marks** 54.5 – 45.5 ✓ = 9.0 ✓	2	
	(c)		**Any two from:** length of pendulum ✓ mass of pendulum bob ✓ amplitude of pendulum swing ✓	2	
	(d)	(i)	reaction time ✓	1	OWTTE
		(ii)	random error ✓	1	
		(iii)	caused by the operator ✓	1	
	(e)	(i)	**FIRST CHECK THE ANSWER ON THE ANSWER LINES If answers = 997(s) (min) and 1003(s) (max.) award 3 marks** 1000 x 0.003 = 3 ✓ = 997 (s) (minimum time value) ✓ = 1003 (s) (maximum time value) ✓	3	
		(ii)	systematic error ✓	1	
			Total	**15**	

Question			Answer	Marks	Guidance
5	(a)		**yes, agree with Amir** t_1, t_2 are similar ✓ confirmed by a calculation e.g. t_1 ~ 0.36, t_2 ~ 0.43 ✓ idea that pattern of traces is similar ✓ **OR** **no, do not agree with Amir** t_1, t_2 are different ✓ confirmed by a calculation e.g. t_1 ~ 0.36, t_2 ~ 0.43 ✓ idea that pattern of traces is different ✓	2	

Question			Answer	Marks	Guidance
5	(b)		**[Level 3]** Candidate shows a high level of understanding and gives a good analysis of the data including valid points from comparisons **and** descriptions. ***(5 – 6 marks)*** **[Level 2]** Candidate shows a limited understanding of data including valid points from comparisons **and** descriptions. ***(3 – 4 marks)*** **[Level 1]** Candidate shows a basic understanding of the data from comparisons **or** descriptions. ***(1 – 2 marks)*** **[Level 0]** Candidate includes **fewer than two** valid points. ***(0 marks)***	6	**Valid points** **Comparisons (to confirm same word spoken) may include:** • maximum frequency is similar • frequency range/trend is similar • loudness range is similar • peak loudness at similar frequency / all are loudest between 1000 and 2000 Hz • similar dip in loudness at 4000 to 6000 Hz/72 to 78 dB • similar rise in loudness at 7000 to 8000 Hz/66 to 69 dB **Description of why the traces may be different:** • loudness is due to power of voice/not due to word • microphone held differently by each speaker • different gender of speakers • different accents of speakers • different ages of speakers • different speed of talking • words may be similar but not identical
	(c)	(i)	**Primary data** **Any one from:** data collected by the investigator ✓ data collected for a specific purpose ✓ **Secondary data** **Any one from:** data collected by somebody else ✓ data collected for some other purpose ✓	2	**ALLOW** yourself

Question			Answer	Marks	Guidance
5	(c)	(ii)	**Any three from:** allows investigator to compare the experimental results with those obtained by other investigators / may be used to justify/contradict experimental results ✓ data already processed/analysed/verified/peer-reviewed/validated ✓ secondary data are available at little/no cost ✓ use of secondary data may save time / secondary data readily available ✓ may generate new ideas for further investigation ✓	3	
			Total	**13**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>6</td><td>(a)</td><td></td><td>
<table>
<tr><th>Author</th><th>Public information scientist</th><th>Scientific journalist</th></tr>
<tr><td>University scientist</td><td>✓</td><td></td></tr>
<tr><td>Scientific book authors</td><td>✓</td><td></td></tr>
<tr><td>Government scientific agencies</td><td>✓</td><td></td></tr>
<tr><td>Newspaper article authors</td><td></td><td>✓</td></tr>
<tr><td>Scientific companies</td><td>✓</td><td></td></tr>
<tr><td>TV programs producers</td><td></td><td>✓</td></tr>
<tr><td>Blog author</td><td></td><td>✓</td></tr>
</table>
</td><td>7</td><td>One mark for each correct row.</td></tr>
<tr><td></td><td>(b)</td><td></td><td>Any three from:

public ✓
scientific community ✓
government organisations/policy makers ✓
NGOs/charitable organisations ✓
industry/commerce ✓</td><td>3</td><td>ALLOW specific named examples, e.g. Cancer Research, IPCC.

ALLOW peers/other scientists</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>10</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
7	(a)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 1.89 x 10^{-4} award 2 marks** $\frac{(18.9 \times 0.01)}{1000}$ ✓ = 1.89 x 10^{-4} ✓	2	**ALLOW** 18.9x10^{5} etc
		(ii)	6 x 1.89 x 10^{-4} =1.134 x 10^{-3} ✓	1	**ALLOW ECF** from the answer to (a)(i)
		(iii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 63.3 (mg) award 4 marks** 1.134 x 10^{-3} x 55.8 ✓ =0.0632772 (g) ✓ Conversion of g to mg = 0.0632772 x 1000 ✓ = 63.3 (mg) (3sf) ✓	4	**ALLOW ECF** from the answer to (a)(ii) **ALLOW** any calculated value given to 3sf
		(iv)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 2.62(%) award 2 marks** $\frac{(65 - 63.3)}{65}$ x 100 ✓ = 2.62(%) ✓	2	**ALLOW ECF** from the answer to (a)(iii)

Question			Answer	Marks	Guidance
		(v)	**Advantage** **Any one from:** spectrophotometer is more specific ✓ uses smaller amounts of solutions ✓ less chance of random error ✓ **Disadvantage** **Any one from:** more expensive equipment needed ✓ more training required to operate the machine ✓ more chance of systematic error ✓	2	**IGNORE** references to portability/ease of use/ORA **ALLOW** references to incorrect calibration
	(b)	**(i)**	elution ✓ elution ✓ scraping ✓ (any order)	3	
		(ii)	scanned ✓ wavelengths ✓ greater ✓ calibration ✓	4	
			Total	18	

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