



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 January 2020

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.

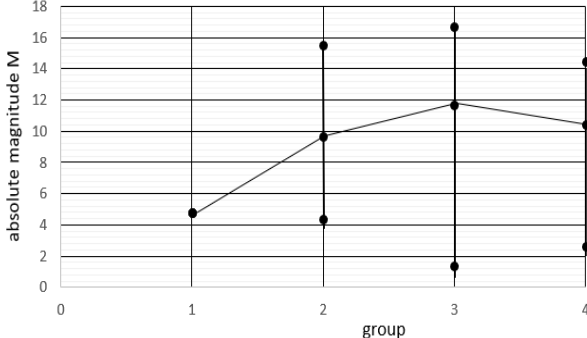
© OCR 2020

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

Question	Answer	Mark	Guidance
(d)	Horizontal axis label and vertical axis label ✓ Points joined by straight lines point-to-point ✓ Average M plotted for all four groups ✓ Range of M plotted for all four groups ✓	4	
(e)	<p>[Level 3] Candidate shows a high level of understanding to identify the conflicting evidence, with at least two comments that supports the conclusion AND at least two comments that do not support the conclusion. (5 – 6 marks)</p> <p>[Level 2] Candidate shows some detailed understanding to identify conflicting evidence with at least one comment that supports the conclusion AND at least one comment that does not support the conclusion. (3 – 4 marks)</p> <p>[Level 1] Candidate shows a basic understanding to identify conflicting evidence with at least two comments that EITHER support OR do not support the conclusion. (1 – 2 marks)</p> <p>[Level 0] Candidate includes fewer than two points. (0 marks)</p>	6	<p>Supports conclusion</p> <ul style="list-style-type: none"> • Mia’s comment is partly true (for groups of stars) • average magnitude increases up to group 3 • average brightness decreases up to group 3 • group 4 could be anomalous <p>Does not support conclusion</p> <ul style="list-style-type: none"> • Mia’s comment is not true for individual stars • group 4 average brightness is more than group 3 • group 4 average magnitude is less than group 3 • group 3 has conflicting evidence • group 3 has the brightest star / has the dimmest star • group 4 does not support the conclusion • only 26 stars is not enough data • 11.7 light years is tiny when compared to the size of the galaxy
Total		21	

Question		Answer	Mark	Guidance
2	(a)	Quick/easy to do / do not need to analyse DNA/dissect the organism / can be carried out in the field ✓	1	ALLOW other realistic suggestions
	(b)	Upper side Dorsal ✓ Noto ✓ Lower side Ventral ✓ Neuro ✓	4	ALLOW in either order ALLOW in either order
	(c)	Photograph / (biological) drawings ✓	1	ALLOW photomicrograph / image
	(d)	Easy to recall/write/read / less space in tables/keys ✓	1	ALLOW other realistic suggestions
	(e)	Notc / notochaetae – only found in Errantia ✓ Dci / dorsal cirrus – only found in Sedentaria ✓	2	AW and ORA If Notc and Dci given without a correct reason = 1 max.
	(f)	3. Arenicoidae ✓ 5. Sabellidae ✓ 6. Nereididae ✓ 7. Eunicadae ✓ Onuphidae ✓	5	ALLOW phonetic spellings MUST be in correct order for statement 7
	(g)	Any one from: Common/established/international scientific language / universally understood ✓ (dead language) Not susceptible to change ✓	1	ALLOW ref to lack of conflict between scientists
Total			15	

Question		Answer	Mark	Guidance
3	(a)	(i)		
		(ii)	1	
		(iii)	2	
	(b)	(i)	2	
		(ii)	1	
	(c)		1	OWTTE
	(d)		1	ALLOW ref to review by others
Total			10	

Question		Answer	Mark	Guidance
4	(a)	Supporting time difference Any one from: Speed is different ✓ Altitude is different ✓ Outside temperature is different ✓ Distance to destination is different ✓ AND Supporting only a small time difference Any one from: Same time to destination ✓ Time at destination is the same ✓	2	
	(b)	(i)		
		Closer to destination ✓ 3 km closer (to destination) ✓ Distance travelled stays the same ✓	3	
		(ii)		
		Any one from: How often the onscreen data is updated ✓ More data/photos covering a longer time period ✓ More photos to show if the data is anomalous ✓	1	
	(c)	Temperature increases as altitude decreases ✓ Temperature increases by 1 °C as altitude decreases by 176 m ✓	2	ORA
	(d)	5797 ± 88 ✓	1	

Question		Answer	Mark	Guidance
(e)	(i)	<p>FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 733 (km h⁻¹) award 2 marks</p> <p>$(737 + 729) \div 2 \checkmark$ $= 733 \text{ (km h}^{-1}\text{)} \checkmark$</p>	2	
	(ii)	<p>FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 15 (s) award 4 marks</p> <p>time = change in distance \div mean speed \checkmark $3 \div 733$ or 0.004092769 (hours) \checkmark $= 14.73396999 \checkmark$ $= 15 \text{ (s)} \checkmark$</p>	4	<p>ALLOW from correct substitution</p> <p>ALLOW ECF from e(i)</p>
	(iii)	<p>Any two from: Change in distance is to the nearest km OR change in speed is to the nearest km/h \checkmark</p> <p>Plane might not be travelling in a straight line, so the distance actually travelled in that time could be greater than the change in distance to destination \checkmark</p> <p>Distance to destination is not updated in real time \checkmark</p> <p>Plane may have spent more or less time at 737 or 727 km/h or travelled at different speeds between/above/below 727-737 km/h during the period \checkmark</p>	2	<p>ALLOW e.g. change in speed is (only) to the nearest km/h</p> <p>ALLOW refs to onscreen data not updated in real time</p>
Total			17	

Question		Answer	Mark	Guidance
5	(a)	2.1 AND 2.3 ✓	1	
	(b)	(i) Systematic ✓	1	
		(ii) (precision) No effect because error is constant ✓ (accuracy) Not accurate because reading too low ✓	2	ALLOW one mark for just stating no effect on precision and not accurate/reduction in accuracy
	(c)	(i) Straight line of best fit drawn through points at 1.5V, 1.6V, 1.9V, 2.2V ✓	1	DO NOT ALLOW if clearly not drawn with a ruler, if line >half a square, if line broken.
		(ii) Best fit line intercepts y-axis from 0.3 to 0.4 (V) ✓	1	Allowable range of 0.35 to 0.45
		(iii) FIRST CHECK THE ANSWER ON ANSWER LINE If answer is in the range from 0.019 to 0.021 award 2 marks Use of best fit line to show a change in p.d. ÷ change in x ✓ G from 0.019 to 0.021 ✓	2	DO NOT ALLOW if dx <20cm ALLOW ECF from (c)(i)
	(d)	(i) FIRST CHECK THE ANSWER ON ANSWER LINE If answer is in the range from 1.4 to 1.8 (Ω) award 3 marks Use of 0.25 (A) ✓ Use of V_i from 5(c)(ii) to calculate a resistance ✓ (Answer in range =) from 1.4 to 1.8 (Ω) ✓	3	

Question		Answer	Mark	Guidance
	(ii)	Any two from: Intercept or V_i is an estimate/ not accurate ✓ Average current/0.3 A gives a resistance closer to the actual value ✓ Resistance of the wire will increase as the filament gets hotter/glows ✓	2	
	(e)	Repeatable ✓ Reproducible ✓	2	
Total			15	

Question		Answer	Mark	Guidance
6	(a)	The number of plants in each beaker ✓	1	
	(b)	(i) 35 ± 3 AND 124 ± 3 ✓	1	
		(ii) Calculated difference \div 21 days = answer ✓	1	Allowable range 3.95 to 4.52 ALLOW ECF using own figures from b(i)
	(c)	(i) 1 ✓ 3 ✓	2	
		(ii) 4 ✓	1	
		(iii) 2 ✓	1	
Total			7	

Question		Answer	Mark	Guidance
7	(a)	Blue-black ✓	1	ALLOW dark/deep blue
	(b)	(i)	1	IGNORE references to reliability
		(ii)	1	
		(iii)	1	
	(c)	(i)	2	ALLOW 1 mark if all 3 values are used and mean titre = 21.1 cm ³
		(ii)	1	ALLOW ECF from (c)(i) If 21.1 cm ³ is used as the mean titre ALLOW 2.11 x 10 ⁻⁵
		(iii)	1	ALLOW ECF from (c)(ii) If 21.1 cm ³ is used as the mean titre ALLOW 2.11 x 10 ⁻⁵
		(iv)	1	ALLOW ECF from (c)(iii) If 21.1 cm ³ is used as the mean titre ALLOW 1.055 x 10 ⁻⁴

Question		Answer	Mark	Guidance
	(v)	$1.05 \times 10^{-4} \times 100/150 = 7 \times 10^{-5} \text{ (mol)}$ ✓	1	ALLOW ECF from (c)(iv) If 21.1 cm ³ is used as the mean titre ALLOW 7.03×10^{-5}
	(vi)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 12.3 (mg) award 2 marks $7 \times 10^{-5} \times 176 = 0.0123(3) \text{ (g)}$ ✓ $= 12.3 \text{ (mg)}$ ✓	2	ALLOW ECF from (c)(v) If 21.1 cm ³ is used as the mean titre ALLOW 12.4 mg ALLOW any calculated result to three sf
	(d)	$12.3 / 4.92 = 2.5 \text{ (times)}$ ✓	1	ALLOW ECF from (c)(vi) If 21.1 cm ³ is used as the mean titre ALLOW 2.52 times
(e)	(i)	$(12.3 + 4.92) / 2 = 8.61 \text{ (mg)}$ ✓	1	ALLOW ECF from (c)(vi) If 21.1 cm ³ is used as the mean titre ALLOW 8.66 mg
	(ii)	There is much more flesh than peel in a potato (so a weighted average is needed) ✓	1	
Total			15	

OCR (Oxford Cambridge and RSA Examinations)
The Triangle Building
Shaftesbury Road
Cambridge
CB2 8EA

OCR Customer Contact Centre

Education and Learning

Telephone: 01223 553998

Facsimile: 01223 552627

Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; The Triangle Building, Shaftesbury Road, Cambridge, CB2 8EA
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553

© OCR 2020

