

Cambridge Technicals

Applied Science

Unit 23: Scientific research techniques

Level 3 Cambridge Technical in Applied Science
05874

Mark Scheme for January 2025

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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.

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MARKING INSTRUCTIONS**PREPARATION FOR MARKING****RM ASSESSOR**

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM Assessor Online Training: OCR Essential Guide to Marking*.
2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are available in RM Assessor
3. Log-in to RM Assessor and mark the **required number** of practice responses (“scripts”) and the **required number** of standardisation responses.

MARKING

1. Mark strictly to the mark scheme.
2. Marks awarded must relate directly to the marking criteria.
3. The schedule of dates is very important. It is essential that you meet the RM Assessor 50% and 100% (traditional 40% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone, email or via the RM Assessor messaging system.

5. Crossed Out Responses

Where a candidate has crossed out a response and provided a clear alternative then the crossed-out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed-out response where legible.

Rubric Error Responses – Optional Questions

Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM assessor, which will select the highest mark from those awarded. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

Multiple Choice Question Responses

When a multiple-choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate). *When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.*

Contradictory Responses

When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

Short Answer Questions (requiring only a list by way of a response, usually worth only one mark per response)

Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

Short Answer Questions (requiring a more developed response, worth two or more marks)

If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space.)

Longer Answer Questions (requiring a developed response)

Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there, then add the annotation 'SEEN' to confirm that the work has been seen and mark any responses using the annotations in section 11.

7. There is a NR (**No Response**) option. Award NR (No Response):
 - if there is nothing written at all in the answer space
 - OR if there is a comment which does not in any way relate to the question (e.g., 'can't do', 'don't know')
 - OR if there is a mark (e.g., a dash, a question mark) which is not an attempt at the question.

Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

8. The RM Assessor **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response:

To determine the level – start at the highest level and work down until you reach the level that matches the answer

To determine the mark within the level, consider the following

Descriptor	Award mark
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

11. Annotations available in RM Assessor

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
BOD	Benefit of doubt given
CON	Contradiction
RE	Rounding error
SF	Error in number of significant figures
ECF	Error carried forward
L1	Level 1
L2	Level 2
L3	Level 3
NBOD	Benefit of doubt not given
SEEN	Noted but no credit given
I	Ignore

12. 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	Marks	Guidance
1			F ✓ A ✓ B ✓	3	ALLOW C or E
			Total	3	

Question			Answer	Marks	Guidance
2	(a)	(i)	<p>Any three from: ✓✓✓ (complexity)</p> <ul style="list-style-type: none"> • similar age • similar education • similar, work/activity/lifestyle/workload • less likely to have other sleep-affecting health issues <p>(reliability)</p> <ul style="list-style-type: none"> • they will understand the research / be able to do the questionnaire <p>(availability)</p> <ul style="list-style-type: none"> • ease of, recruitment/monitoring/accessibility <p>(accuracy / reliability)</p> <ul style="list-style-type: none"> • large sample size 	3	<p>ALLOW medical students are busy IGNORE health issues unqualified</p> <p>ALLOW wide = large</p>
		(ii)	<p>amount of, tyramine/cheese/cheddar, contained in food/eaten/taken ✓</p> <p>quality/amount of, sleep/dreaming/wakefulness ✓</p>	2	<p>OWTTE ALLOW dose (of tyramine) = amount of</p>
		(iii)	<p>there is/is not a link between amount of tyramine consumed and sleep quality/REM/dreaming/alertness ✓</p>	1	<p>OWTTE IGNORE refs to norepinephrine</p>

Question		Answer	Marks	Guidance
	(b)	Any two from: To prevent harm / keep them (subjects) safe / humans are the test subjects ✓ (to know the) side effects of norepinephrine ✓ (to know if) test subjects have allergies / health problems ✓	2	IGNORE prevent illness
		Total	8	

Question			Answer	Marks	Guidance
3	(a)	(i)	absorbance ✓ concentration / mass (of nitrate) ✓	2	ALLOW 1 mark max for dependent and independent ALLOW either order ALLOW mg/l nitrate = concentration
		(ii)	Any two from: draw a line of best fit ✓ find the gradient of the line ✓ compare the, two sets of values/concentration and absorbance ✓	2	ALLOW divide the change in the y values by the change in the x values / $\Delta y/\Delta x$
		(iii)	measure the absorbance (of the sample) ✓ interpolate (from the graph) / read the (X/Y) axis value at the intercept with line of best fit ✓	2	OWTTE
	(b)		Any one from: ✓ COSSH use of, PPE/named PPE item (e.g. gloves, goggles) risk assessment	1	ALLOW correct reference to a health and safety procedure (unqualified)
	(c)		<i>Distilled water:</i> consistent chemical composition / is pure / contains no, (named) impurities/contaminants /chemicals ✓	1	ORA for tap water ALLOW particles, other substances IGNORE clean; bacteria; less (impurities etc)

Question		Answer	Marks	Guidance
	(d)	Any one from: ✓ easier/easy manipulation of data e.g. calculations/ graphs easier/easy sharing/access/retrieval/storage (of data)	1	ALLOW made public = sharing
		Total	9	

Question		Answer	Marks	Guidance
4	(a)	<p>Source A - to provide advice to/raise awareness in, consumers of skincare products / marketing / product promotion / trade, website/group ✓</p> <p>Source B - marketing / raising awareness of the, analytical techniques/methods of SLS detection /services they offer ✓</p>	2	IGNORE bias unqualified
	(b)	(i)	2	<p>ALLOW reference to the bias of Source A</p> <p>OWTTE</p>
		(ii)	2	<p>ALLOW 1 mark max for different attitudes/views unqualified if neither of first two MPs earned (e.g. more lenient, different stance)</p> <p>IGNORE how different countries operate regulations</p>
	(c)	(i)	2	
		(ii)	2	

Question		Answer	Marks	Guidance
	(iii)	<p>Any one from: ✓</p> <p>consumer concern about the risks/safety of SLS</p> <p>("SLS free" label would) sell (more) products / maintain profits</p> <p>good for, company image/PR /appeal to wider audience</p>	1	
	(iv)	<p>Any two from: ✓✓</p> <ul style="list-style-type: none"> • consumer concern about risks/ safety of SLS (if not given as 'reason') • (they assumed) the claims made by their chemical suppliers were true • (they assumed) they didn't need to check/verify • (they assumed) their own analysis was correct 	2	<p>OWTTE</p> <p>IGNORE their products wouldn't be checked/ tested</p>
(d)	(i)	<p>Any four from: ✓✓✓✓</p> <ul style="list-style-type: none"> • (data collection) validity • (data collection) reliability • consistent chemical composition • hazards / risks / safety • cost • complexity / ease of use • repeatability • accuracy • availability / accessibility • precision / places of readability 	4	<p>IGNORE reproducibility</p>

Question		Answer	Marks	Guidance
	(ii)	Any three from: ✓✓✓ <ul style="list-style-type: none">• Standard, Analytical Practice/Operating Procedures• health and safety procedures• Risk assessment• COSHH adherence• calibration of equipment• training (of employees)	3	ALLOW named example, e.g. use of PPE
		Total	20	

Question	Answer	Marks	Guidance
5	<p data-bbox="197 220 297 252">Report</p> <p data-bbox="342 220 627 252">Levels of Response</p> <p data-bbox="342 292 448 323">Level 3</p> <ul data-bbox="342 331 1041 1117" style="list-style-type: none"> • Provides a detailed justification of the focus of the research • Detailed information and evidence generated which is clearly relevant and applicable to the area of focus • Information is interpreted and used effectively, justifying the findings reported • Detailed evaluation of methods and sources used and evidence generated • Detailed conclusions based on the sources used and evidence generated • Clear consideration of the validity, reliability and generalisability of the research undertaken • Implications of the findings are well thought through and clearly presented. • Provides clear proposals of possible areas for further research which are relevant to the focus/theme and are feasible. • Well-structured and clear reporting with correct terminology used • Many points are developed <p data-bbox="828 1125 1041 1157" style="text-align: right;">[16 – 20 marks]</p>	20	<p data-bbox="1193 220 1366 252">Valid points</p> <ul data-bbox="1193 292 2038 1181" style="list-style-type: none"> • Explanation of area of focus <ul style="list-style-type: none"> ○ is clear and concise ○ may be expressed as question(s) to explore ○ related to the pre-released material ○ may be oppositional ○ may be a different slant • Justification <ul style="list-style-type: none"> ○ in relation to the pre-release ○ in relation to own personal interest in the theme ○ in relation to another specific source ○ in relation to current/contemporary issues linked to the pre-release • Reporting of findings taking into consideration: <ul style="list-style-type: none"> ○ appropriate use of information/data ○ comparing and contrasting methods, results or findings ○ relevance and appropriateness of findings from information gathered ○ clear link and relevance to area of focus being researched ○ acknowledgement of sources ○ avoidance of plagiarism ○ consideration of any relevant ethical issues

Question	Answer	Marks	Guidance
	<p>Level 2</p> <ul style="list-style-type: none"> • Provides a sound justification of the focus of the research. • Detailed information and evidence generated which is of some relevance to the area of focus • Information is interpreted and used effectively at times • Some evaluation of research conducted but may only focus on some of methods used, sources used and evidence generated • Reasonable conclusions based on the sources used and evidence generated • Some consideration of the validity, reliability and generalisability of the research undertaken but may be more general than in relation to specific aspects such as methodology. • Implications of the findings are provided but may be quite general in nature. • Provides a reasonable proposal for possible areas for further research which has some relevance to the focus/theme and are feasible. • Reasonably clear reporting of findings, using correct terminology • Some points are developed <p style="text-align: right;">[9 – 15 marks]</p>		<ul style="list-style-type: none"> • Evaluation of research should aim to assess validity, reliability and generalisability related to the following: <ul style="list-style-type: none"> Method(s) chosen <ul style="list-style-type: none"> ○ quantitative and/or qualitative ○ primary and/or secondary ○ details of methods (e.g. survey, questionnaire, interview, literature review, etc...) ○ participants (where applicable) ○ ethical considerations Evidence generated <ul style="list-style-type: none"> ○ notes and records ○ types of data ○ selecting/collecting/interpreting relevant data, graphs and tables ○ analysis of results (e.g. compilation of data, results and findings, use of methods of analysis valid for data collected, including triangulation, use of percentages, use of statistical averages) ○ appropriate referencing and acknowledgement of sources ○ advanced search tools and refining search data Source material(s) used <ul style="list-style-type: none"> ○ Identifying secondary sources: <ul style="list-style-type: none"> ▪ Library search carried out ▪ Lists the key terms used ○ Selecting secondary sources <ul style="list-style-type: none"> ▪ Appropriate ▪ Relevant ▪ Complimentary ▪ Trustworthy

Question	Answer	Marks	Guidance
	<p>Level 1</p> <ul style="list-style-type: none"> • Provides a basic description of the focus of the research • Basic information and evidence generated which is not always relevant to the area of focus • Findings are basic; information gathered is used with limited effectiveness • Some description of methods used, sources used and evidence generated • Limited consideration of the impact on the validity and reliability but may be more general than in relation to specific aspects such as methodology • Some more developed points made • Some basic conclusions drawn but may not always clearly relate to the evidence generated • Limited consideration of the validity, reliability and generalisability of the research undertaken • Some implications of the findings may be suggested • Proposes some possible areas for further research which show some relevance to the focus/theme but may be unrealistic • Reporting is limited in terms of style, structure and use of terminology (list-like answers should be placed in this level) • Very few, if any, developed points <p style="text-align: right;">[1 - 8 marks]</p> <p>Level 0 Candidate includes fewer than two valid points. [0 marks]</p>		<ul style="list-style-type: none"> ▪ identifies possible bias ▪ strengths or limitations of research methods used ▪ ethics of the research ▪ representativeness of samples <ul style="list-style-type: none"> • Conclusions will bring together your key findings, your evaluation and relate them back to your focus and should: <ul style="list-style-type: none"> ○ be in relation to the area of focus/research question/hypothesis ○ make judgements on evidence/findings ○ use the information gathered ○ consider the validity, reliability and generalisability of the research conducted • Answer may assess implications of findings for: <ul style="list-style-type: none"> ○ Individuals ○ groups ○ practitioners/professionals ○ practice ○ private, public, voluntary sectors ○ areas of policy ○ those who carry out research ○ particular areas of sport science and sport studies • Proposals for relevant areas for further research may include: <ul style="list-style-type: none"> ○ questions that have not been answered ○ areas where further evidence is needed ○ alternative research methods that could be used

Question	Answer	Marks	Guidance
			<ul style="list-style-type: none">• Proposals should:<ul style="list-style-type: none">○ be plausible and realistic○ build on current knowledge○ relate to the focus and/or theme○ be linked to limitations identified
		Total	60

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