



Oxford Cambridge and RSA

# **Cambridge Technicals Applied Science**

## **Unit 23: Scientific Research Techniques**

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

## **Mark Scheme for January 2021**

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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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Question		Answer	Mark	Guidance
1	(a)	<p>There is a link between blood type and personality traits / emotional character ✓</p> <p><b>Any one from:</b>  <i>To prove</i> – people with same blood group will display same personality traits ✓  <i>To disprove</i> – people with same blood group will not display same personality traits ✓</p> <p><b>OR</b></p> <p>There is <b>no</b> link between blood type and personality traits / emotional character ✓</p> <p><b>Any one from:</b>  <i>To prove</i> - people with same blood group will not display same personality traits ✓  <i>To disprove</i> - people with same blood group will display same personality traits ✓</p>	2	
	(b)	<p>idea that (if) “emotional character” and “personality traits” are measured in the same way (then) ✓</p> <p>the 2011 study found ‘no relation’ but the 2015 study found ‘significant association’ ✓</p>	2	<b>ALLOW</b> emotional character and personality traits are the same thing
		<b>Total</b>	<b>4</b>	

Question		Answer	Mark	Guidance
2	(a)	Written ✓ formal ✓ structured ✓	3	
	(b)	use a numbered scale ✓ to indicate level of agreement/disagreement with statements ✓	2	OWTTE
	(c)	<b>Any three from:</b> large sample size ✓  representative cross-section of participants ✓  all did the same questionnaire ✓  given the same amount of time to complete the questionnaire ✓  idea that conscientiousness or the questionnaire questions have the same meaning (in all regions) ✓  idea that conscientiousness is an independent human characteristic/is not dependent on culture ✓	3	<b>ALLOW</b> no bias in sample of participants  <b>ALLOW</b> questions not 'leading'
	(d)	range of data in which the mean lies (with 95% certainty) ✓	1	OWTTE
		<b>Total</b>	<b>9</b>	

Question		Answer	Mark	Guidance
3	(a)	<p><b>Any three from:</b>  hazard / risk ✓  (long term exposure to loud sound) hearing damage ✓</p> <p>validity / reliability / accuracy ✓  measurements have close agreement with standard test results ✓</p> <p>validity / complexity ✓  data can be gathered across the hearing range ✓</p> <p>complexity ✓  compatible with other technology ✓</p> <p>complexity / portability ✓  on-site use ✓</p> <p>repeatability ✓  close agreement /valid comparison, between successive measurements (under the same conditions) ✓</p>	6	
	(b)	<p>(they provide) material for, developing a research brief/writing the introduction to a report, to set the scene / material which forms the 'discussion' part of a report ✓</p> <p><b>OR</b></p> <p>(they provide) benchmark standards/data which may be used to, evaluate/compare with, new research ✓</p>	1	<p><b>IGNORE</b> 'they provide material' unqualified  <b>ALLOW</b> set the scene = background information</p> <p><b>IGNORE</b> 'they provide data' unqualified</p>
		<b>Total</b>	<b>7</b>	

Question		Answer	Mark	Guidance
4	(a)	<p><b>Source A</b>  <b>Any three from:</b>  report of the results/conclusions of work done by others ✓  no hypothesis given ✓  no data is provided to support conclusions ✓  not subject to peer review/academic scrutiny ✓  refers to original sources/authors (so claims can be checked) ✓  AVP ✓</p> <p><b>Source B</b>  <b>Any three from:</b>  report of the method/results/conclusions of work done by the authors themselves ✓  hypothesis given ✓  subject to peer review/academic scrutiny/Govt. publication ✓  methodology is described ✓  no sample size given ✓  results are used to justify conclusions ✓  AVP ✓</p>	6	
	(b)	<p>makes you fitter/healthier ✓  boosts metabolic rate ✓  reduces/reverses mitochondrial deterioration ✓</p>	3	<b>ALLOW</b> reduced risk of diabetes

Question	Answer	Mark	Guidance
(c)	<p><b>Reliability</b> <b>Any three from:</b> (participants are all) young physically active male students ✓</p> <p>(this ensures some) uniformity of data ✓</p> <p>sample is not representative of the population ✓</p> <p>sample size not given ✓</p> <p>small sample sizes may have higher margins of error / less certainty about the data ✓</p> <p>large sample sizes will require full statistical analysis (to enhance their reliability) ✓</p> <p><b>Reproducibility</b> <b>Any three from:</b> size of sample/number of participants, not stated ✓</p> <p>the experiments/exercises are described ✓</p> <p>apparatus used are described ✓</p> <p>others can repeat/check the study ✓</p>	6	

Question		Answer	Mark	Guidance
	(d) (i)	<p><b>Any three from:</b></p> <p>control of variables ✓</p> <p>one <b>named</b> variable, e.g. duration of study, cohort, braked ergometer (accept other) ✓</p> <p>changing only, one variable/exercise intensity ✓</p> <p>establishing VO<sub>2</sub> max baseline/before training ✓</p> <p>repeat data / multiple participants ✓</p>	3	
	(d) (ii)	<p><b>Any two from:</b></p> <p>(risk assessment) recorded / discussed with participants / participants informed of hazards/risks ✓</p> <p>measures taken to reduce risks / warm-up session completed by all participants (across the two experiments) ✓</p> <p>any current medical conditions identified / medical history taken ✓</p> <p>adherence to risk assessment / no exceeding of exercise protocols ✓</p>	2	<b>ALLOW</b> named conditions e.g. asthma, heart defects, high blood pressure
		<b>Total</b>	<b>20</b>	



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

Question	Answer	Mark	Guidance
	<p><b>Level 2</b></p> <ul style="list-style-type: none"> <li>• Provides a sound justification of the focus of the research.</li> <li>• Detailed information and evidence generated which is of some relevance to the area of focus</li> <li>• Information is interpreted and used effectively at times</li> <li>• Some evaluation of research conducted but may only focus on some of methods used, sources used and evidence generated</li> <li>• Reasonable conclusions based on the sources used and evidence generated</li> <li>• Some consideration of the validity, reliability and generalizability of the research undertaken but may be more general than in relation to specific aspects such as methodology.</li> <li>• Implications of the findings are provided but may be quite general in nature.</li> <li>• Provides a reasonable proposal for possible areas for further research which has some relevance to the focus/theme and are feasible.</li> <li>• Reasonably clear reporting of findings, using correct terminology</li> <li>• Some points are developed</li> </ul> <p style="text-align: right;"><b>[9 – 15 marks]</b></p>		<p>acknowledgement of sources</p> <ul style="list-style-type: none"> <li>○ avoidance of plagiarism</li> <li>○ consideration of any relevant ethical issues</li> </ul> <ul style="list-style-type: none"> <li>• <b>Evaluation</b> of research should aim to assess validity, reliability and generalizability related to the following: <ul style="list-style-type: none"> <li>Method(s) chosen <ul style="list-style-type: none"> <li>○ quantitative and/or qualitative</li> <li>○ primary and/or secondary</li> <li>○ details of methods (e.g. survey, questionnaire, interview, literature review, etc...)</li> <li>○ participants (where applicable)</li> <li>○ ethical considerations</li> </ul> </li> <li>Evidence generated <ul style="list-style-type: none"> <li>○ notes and records</li> <li>○ types of data</li> <li>○ selecting/collecting/interpreting relevant data, graphs and tables</li> <li>○ 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)</li> <li>○ appropriate referencing and acknowledgement of sources</li> </ul> </li> </ul> </li> </ul>

Question	Answer	Mark	Guidance
	<p><b>Level 1</b></p> <ul style="list-style-type: none"> <li>• Provides a basic description of the focus of the research</li> <li>• Basic information and evidence generated which is not always relevant to the area of focus</li> <li>• Findings are basic; information gathered is used with limited effectiveness</li> <li>• Some description of methods used, sources used and evidence generated</li> <li>• Limited consideration of the impact on the validity and reliability but may be more general than in relation to specific aspects such as methodology</li> <li>• Some more developed points made</li> <li>• Some basic conclusions drawn but may not always clearly relate to the evidence generated</li> <li>• Limited consideration of the validity, reliability and generalizability of the research undertaken</li> <li>• Some implications of the findings may be suggested</li> <li>• Proposes some possible areas for further research which show some relevance to the focus/theme but may be unrealistic</li> <li>• Reporting is limited in terms of style, structure and use of terminology (list-like answers should be placed in this level)</li> </ul>		<ul style="list-style-type: none"> <li>○ advanced search tools and refining search data</li> <li>Source material(s) used</li> <li>○ Identifying secondary sources: <ul style="list-style-type: none"> <li>▪ Library search carried out</li> <li>▪ Lists the key terms used</li> </ul> </li> <li>○ Selecting secondary sources <ul style="list-style-type: none"> <li>▪ Appropriate</li> <li>▪ Relevant</li> <li>▪ Complimentary</li> <li>▪ Trustworthy</li> <li>▪ identifies possible bias</li> <li>▪ strengths or limitations of research methods used</li> <li>▪ ethics of the research</li> <li>▪ representativeness of samples</li> </ul> </li> <li>• <b>Conclusions</b> will bring together your key findings, your evaluation and relate them back to your focus and should: <ul style="list-style-type: none"> <li>○ be in relation to the area of focus/research question/hypothesis</li> <li>○ make judgements on evidence/findings</li> <li>○ use the information gathered</li> <li>○ consider the validity, reliability and generalizability of the</li> </ul> </li> </ul>

Question	Answer	Mark	Guidance
	<ul style="list-style-type: none"> <li>• Very few, if any, developed points</li> </ul> <p style="text-align: right;"><b>[1 - 8 marks]</b></p> <p><b>Level 0</b></p> <p>Candidate includes fewer than two valid points.</p> <p style="text-align: right;"><b>[0 marks]</b></p>		<p style="text-align: center;">research conducted</p> <ul style="list-style-type: none"> <li>• Answer may assess implications of findings for: <ul style="list-style-type: none"> <li>○ Individuals</li> <li>○ groups</li> <li>○ practitioners/professionals</li> <li>○ practice</li> <li>○ private, public, voluntary sectors</li> <li>○ areas of policy</li> <li>○ those who carry out research</li> <li>○ particular areas of sport science and sport studies</li> </ul> </li> <li>• Proposals for relevant areas for further research may include: <ul style="list-style-type: none"> <li>○ questions that have not been answered</li> <li>○ areas where further evidence is needed</li> <li>○ alternative research methods that could be used</li> </ul> </li> <li>• Proposals should: <ul style="list-style-type: none"> <li>○ be plausible and realistic</li> <li>○ build on current knowledge</li> <li>○ relate to the focus and/or theme</li> <li>○ be linked to limitations identified</li> </ul> </li> </ul>
	<b>Total</b>	<b>60</b>	

**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](mailto:general.qualifications@ocr.org.uk)

[www.ocr.org.uk](http://www.ocr.org.uk)

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

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