

**Cambridge Technicals
Applied Science**

Unit 23: Scientific Research Techniques

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

Mark Scheme for January 2020

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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><i>any five from:</i></p> <p>valid / reliable data✓ not hazardous / safe✓ cheap✓ easy to use✓ repeatable✓ reliable✓ accurate✓ readily available✓</p>	5	Mark as a list ACCEPT more than one MP on any numbered line										
	(b)	<table border="1"> <tr> <td>Source of feedback</td> <td>Peers / experts / customers / consumers /public✓</td> </tr> <tr> <td>Form of feedback</td> <td>Verbal / written / electronic / formal / informal / structured / unstructured✓</td> </tr> <tr> <td>Method of gathering feedback</td> <td>Interviews / conversation / surveys / focus groups✓</td> </tr> <tr> <td>Objective of gathering feedback</td> <td>objectivity / unbiased / to improve product✓</td> </tr> <tr> <td>How to evaluate feedback</td> <td>compare response with number on table✓</td> </tr> </table>	Source of feedback	Peers / experts / customers / consumers /public✓	Form of feedback	Verbal / written / electronic / formal / informal / structured / unstructured✓	Method of gathering feedback	Interviews / conversation / surveys / focus groups✓	Objective of gathering feedback	objectivity / unbiased / to improve product✓	How to evaluate feedback	compare response with number on table✓	5	A/W
Source of feedback	Peers / experts / customers / consumers /public✓													
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Objective of gathering feedback	objectivity / unbiased / to improve product✓													
How to evaluate feedback	compare response with number on table✓													
		Total	10											

Question		Answer	Mark	Guidance
2	(a)	<p>Hypothesis format:</p> <p>Coffee has an effect on diabetes risk in humans ✓</p> <p>Key words in hypothesis:</p> <p>components/compounds/adiponectin (in coffee) /men (who drink coffee) ✓</p> <p>Assumptions:</p> <p><i>any three from:</i></p> <p>adiponectin affects humans as it does for mice ✓</p> <p>coffee consumption produces the same 'high' levels that are effective in GM mice ✓</p> <p>coffee raises adiponectin in all humans (not just Japanese men) ✓</p> <p>other lifestyle factors (of the coffee drinkers) such as diet and exercise can be controlled ✓</p> <p>coffee drinkers seek medical diagnoses at the same rate as non-drinkers of coffee ✓</p> <p>AVP ✓</p>	5	<p>1 mark for correct ref to diabetes and coffee in humans</p> <p>ALLOW 1 directional (coffee decreases risk...) or 2 directional (coffee affects risk...) hypothesis</p> <p>NOTE the 2nd marking point is for correct addition of at least one of the key words</p> <p>ALLOW coffee raises adiponectin high enough to have the same effect in humans = 2 marks</p> <p>ALLOW the effect is the same in humans as mice</p>

Question	Answer	Mark	Guidance
(b)	<p><i>any two from</i></p> <p>a separate area for the taking of blood / blood should never be taken in any room normally used as a laboratory or office✓</p> <p>protective clothing should be worn / wear a (clean) lab coat / wear disposable gloves / eye protection✓</p> <p>additional disposable protective apron when taking blood from people who are known or suspected to carry bloodborne viruses✓</p> <p>avoidance of spillage or splashing onto patient, staff, surfaces, the outside of the sample tube, forms etc ✓</p> <p>transport of samples in fastened containers✓</p> <p>dispose of used needles/PPE in designated receptacles✓</p> <p>labelling of specimens✓</p> <p>decontaminate non-disposable items✓</p> <p>use sterilising wipes on patient before taking sample✓</p>	2	<p>IGNORE spills unqualified</p> <p>IGNORE disposal unqualified</p> <p>IGNORE decontaminate unqualified</p>
	Total	7	

Question		Answer	Mark	Guidance
3	(a)	(to demonstrate/show that) interviews can be used to assess children's understanding ✓	1	
	(b)	idea that the method/interviewing should produce an outcome that is consistent with other forms of assessing children e.g. written tests ✓	1	
	(c)	<p><i>any one from:</i></p> <p>the methods (of interviewing and analysis) are repeatable ✓</p> <p>the children should be given the same questions ✓</p> <p>give the children a written test, a high interview score should predict a high test score ✓</p>	1	ALLOW a detailed description of repeatable e.g. the children are similar age range, mixed abilities, mixture of boys/girls
Total			3	

Question		Answer	Mark	Guidance
4	(a)	<p><i>any four from:</i></p> <p>systemic action ✓</p> <p>persistence in crops and soil ✓</p> <p>potency at low concentrations ✓</p> <p>reduced number of spray applications ✓</p> <p>widespread use on many cropping systems / named method of application ✓</p>	4	<p>IGNORE safety</p> <p>ALLOW smaller volume required (compared to other pesticides)</p> <p>IGNORE used for many years</p>
	(b)	<p>Legislation: both sources refer to EU imposed partial ban ✓</p> <p>Bias: A <i>biased against (no mark)</i> due to 'high risk to bees' / 'they pose poorly understood risks' AVP ✓</p> <p>B <i>biased in favour (no mark)</i> due to 'theoretical risk' / 'studies should be treated with caution' / 'there are conflicting studies' / AVP ✓</p> <p>Regulation: both sources refer to instructions for use / warning labels / correct application of the products ✓</p> <p>A suggests there are problems with ensuring compliance ✓</p> <p>B states that no studies show adverse effects when products are applied correctly ✓</p>	6	<p>Justification for A must use evidence from the source.</p> <p>Justification for B must use evidence from the source.</p> <p>ALLOW current regulatory practices don't adequately assess neonics' effects</p>

Question		Answer	Mark	Guidance	
	(c)	(i)	Neonics do / do not cause harm to bees ✓	1	
		(ii)	<p>any four from:</p> <p>restrictions should be lifted / restrictions should remain ✓</p> <p>users should made aware of risks / sublethal effects (to bees and other non-target invertebrates) ✓</p> <p>regulations/risk assessments should be modified ✓</p> <p>amounts of neonics in residues should be quantified / legal limit should be quantified ✓</p> <p>issue policies/guidelines (for use) ✓</p>	4	ALLOW there may be a permanent ban
	(d)	(i)	<p>(<i>reason</i>) repeatability of the method ✓</p> <p>(<i>explanation</i>) by the same researcher using the same instruments / allows precision/accuracy to be assessed ✓</p> <p>(<i>reason</i>) validity /reliability of data collection method ✓</p> <p>(<i>explanation</i>) the scientific community will be more likely to accept results / increases confidence in the results ✓</p>	2+2	

Question	Answer	Mark	Guidance
	(ii) gas chromatography ✓	1	Additional ticks negate mark
	Total	20	

Question	Answer	Mark	Guidance
5	Report	20	Valid points
	<p>Levels of Response</p> <p>Level 3</p> <ul 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 generalizability 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 		<ul 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

Question	Answer	Mark	Guidance
	<ul style="list-style-type: none"> • Many points are developed <p style="text-align: right;">[16 – 20 marks]</p> <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 generalizability 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. 		<ul style="list-style-type: none"> ○ 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 o acknowledgement of sources ○ avoidance of plagiarism ○ consideration of any relevant ethical issues • Evaluation of research should aim to assess validity, reliability and generalizability 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

Question	Answer	Mark	Guidance
	<ul style="list-style-type: none"> • Reasonably clear reporting of findings, using correct terminology • Some points are developed <p style="text-align: right;">[9 – 15 marks]</p> <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 generalizability of the research undertaken • Some implications of the findings may be suggested 		<ul style="list-style-type: none"> ○ 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 <p>Source material(s) used</p> <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 • identifies possible bias • strengths or limitations of research methods used • ethics of the research

Question	Answer	Mark	Guidance
	<ul style="list-style-type: none"> • 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</p> <p>Candidate includes fewer than two valid points. [0 marks]</p>		<ul style="list-style-type: none"> • representativeness of samples • 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 generalizability 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

Question	Answer	Mark	Guidance
			<ul style="list-style-type: none"> ○ 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 • 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	20	
	Overall paper total	60	

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

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