OCR
Oxford Cambridge and RSA

Level 3 Cambridge Technical in Applied Science

Unit 23: Scientific research techniques

Sample Assessment Material

Date – Morning/Afternoon

Time Allowed: 2 hours

You must have:
- Pre-Release booklet **TO BE MADE AVAILABLE FOLLOWING COPYRIGHT CLEARANCE**

You may use:
- A calculator
- A ruler

* 800000001 *

First Name		Last Name	

Centre Number						Candidate Number				

Date of Birth								

INSTRUCTIONS
- Use black ink.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Write your answer to each question in the space provided.
- If additional space is required, use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the bar codes.
- This paper includes questions based on pre-release materials issued 6 weeks prior to the published examination date which will have been collected in by the teacher one calendar week prior to the exam date.
- The pre-release and notes must then be returned to learners **immediately before the exam commences**.
- The pre-release and notes **must** be submitted along with the learners' Question Paper at the end of the examination (attach with treasury tags).
- The Periodic Table is printed on the back page.

INFORMATION
- The total mark for this paper is **60**.
- The marks for each question are shown in brackets **[ ]**
- Quality of written communication will be assessed in the question(s) marked with a ✎.
- You may use the pre-release material in which you made notes about your own research in this examination.
- This document consists of **25** pages.

Answer **all** questions.

1. Ben is required to use secondary sources to develop a research plan.

He is aware that the research must be reliable and relevant.

(a) Explain **two** other factors Ben should consider in developing his plan.

1……

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2……..

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[4]

(b) Ben expects to find some numerical data during his research.
Suggest two other types of data available for Ben to utilise.

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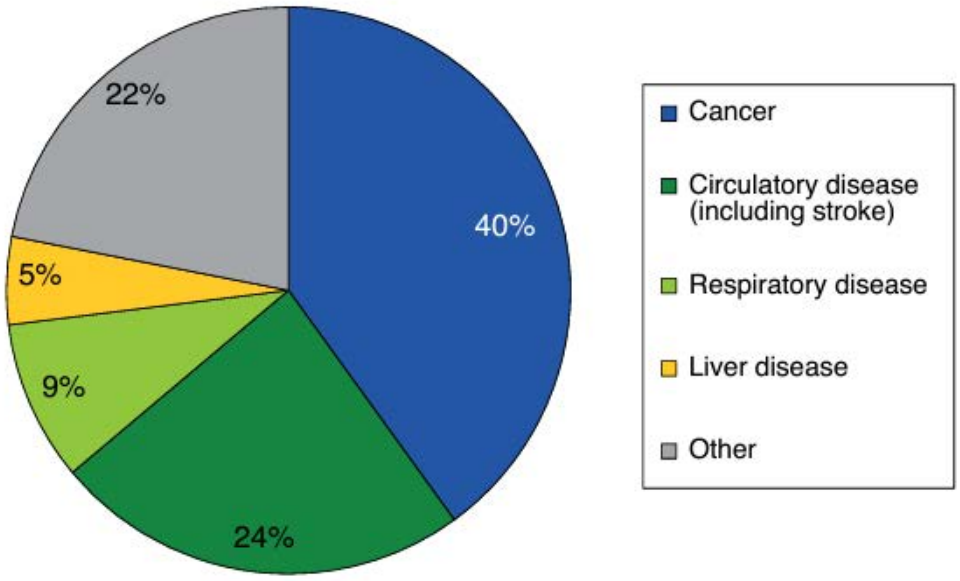
[2]

2. A health magazine includes an article about various diseases linked to smoking.

The Editor decided to present the results as a pie chart. (**Fig.1**)



(a) Suggest **two** reasons and explain why the pie chart may be misleading.

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[4]

Turn over

(b) List **three** additional facts that are needed before making conclusions based on these data.

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[3]

3. Nathan and Lucy are having a debate about the orange colour in fresh orange juice compared to the orange colour of sweets.

Lucy suggests that it must be something to do with molecules.

(a) Write a hypothesis based on this debate.

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[2]

(b) Explain why you have chosen this hypothesis.

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[2]

(c) State an appropriate scientific technique to prove or disprove your hypothesis.

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[1]

(d) Justify your choice of technique.

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[2]

Questions **4** and **5** relate to the pre-release material you have studied and your secondary research.

4. With reference to **Source A**:

(a) Identify **four** key properties of bottled water.

1 ……

2 ……

3 ……

4 ……

[4]

(b) Consider sources **A** and **B** in relation to bias and reliability.

Justify your answer.

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[5]

Turn over

(c) Suggest the social purposes of the information in **Source B**.

Use the information in the pre-release material and your secondary research to complete your answer.

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[5]

(d) It is important to share the information in sources A and B with a wider audience.

(i) List **three** other types of media which could be used to share the information.

1 ……

2 ……

3 ……

[3]

(ii) Suggest the procedures and protocols to be followed when testing the quality of water.

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[3]

5. Write a report on your own research related to the pre-release material, including the following:

- the area of focus you have chosen;
- the findings from your research;
- evaluation of your research with reference to:
  - o method(s) chosen
  - o evidence generated
  - o source material(s) used
- conclusions and implications of your findings;
- areas where further research may be required.

Turn over

[20]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

PLEASE DO NOT WRITE ON THIS PAGE

PERIODIC TABLE OF THE ELEMENTS

1 H 1.0079 Hydrogen																	2 He 4.0026 Helium
3 Li 1.941 Lithium	4 Be 9.0122 Beryllium											5 B 10.811 Boron	6 C 12.011 Carbon	7 N 14.007 Nitrogen	8 O 15.999 Oxygen	9 F 18.998 Fluorine	10 Ne 20.180 Neon
11 Na 22.990 Sodium	12 Mg 24.305 Magnesium											13 Al 26.982 Aluminium	14 Si 28.086 Silicon	15 P 30.974 Phosphorus	16 S 32.065 Sulfur	17 Cl 35.453 Chlorine	18 Ar 39.948 Argon
19 K 39.098 Potassium	20 Ca 40.078 Calcium	21 Sc 44.956 Scandium	22 Ti 47.867 Titanium	23 V 50.942 Vanadium	24 Cr 51.996 Chromium	25 Mn 54.938 Manganese	26 Fe 55.845 Iron	27 Co 58.933 Cobalt	28 Ni 58.693 Nickel	29 Cu 63.546 Cooper	30 Zn 65.39 Zinc	31 Ga 69.723 Gallium	32 Ge 1.0079 Germanium	33 As 74.992 Arsenic	34 Se 78.96 Selenium	35 Br 79.904 Bromine	36 Kr 83.80 Krypton
37 Rb 85.468 Rubidium	38 Sr 87.62 Strontium	39 Y 88.906 Yttrium	40 Zr 91.224 Zirconium	41 Nb 92.906 Niobium	42 Mo 95.94 Molybdenum	43 Tc 98 Technetium	44 Ru 101.07 Ruthenium	45 Rh 102.91 Rhodium	46 Pd 106.42 Palladium	47 Ag 107.87 Silver	48 Cd 112.41 Cadmium	49 In 114.82 Indium	50 Sn 118.71 Tin	51 Sb 121.76 Antimony	52 Te 127.60 Tellurium	53 I 126.90 Iodine	54 Xe 131.29 Xenon
55 Cs 132.91 Cesium	56 Ba 137.33 Barium	57 - 71 La - Lu	72 Hf 178.49 Hafnium	73 Ta 180.95 Tantalum	74 W 183.84 Tungsten	75 Re 186.21 Rhenium	76 Os 190.23 Osmium	77 Ir 192.22 Iridium	78 Pt 195.08 Platinum	79 Au 196.97 Gold	80 Hg 200.59 Mercury	81 Tl 204.38 Thallium	82 Pb 207.2 Lead	83 Bi 208.98 Bismuth	84 Po 209 Polonium	85 At 210 Astatine	86 Rn 222 Radon
87 Fr 223 Francium	88 Ra 226 Radium	89 - 103 Ac - Lr	104 Rf 261 Rutherfordium	105 Db 262 Dubnium	106 Sg 266 Seaborgium	107 Bh 264 Bohrium	108 Hs 269 Hassium	109 Mt 268 Meitnerium	110 Uun 271 Ununnilium	111 Uuu 272 Unununium	112 Uub 1.0079 Ununbium	113 Uut Ununtrium	114 Uuq 289 Ununquadium	115 Uup Ununpentium	116 Uuh Ununhexium	117 Uus Ununseptium	118 Uuo Ununoctium
Lanthanide series		57 La 138.91 Lanthanide	58 Ce 140.12 Cerium	59 Pr 140.91 Praseodymium	60 Nd 144.24 Neodymium	61 Pm 145 Promethium	62 Sm 150.36 Samarium	63 Eu 151.96 Europium	64 Gd 157.25 Gadolinum	65 Tb 158.93 Terbium	66 Dy 162.5 Dysprosium	67 Ho 164.93 Holmium	68 Er 1.0079 Erbium	69 Tm 168.93 Thulium	70 Yb 173.04 Yttersium	71 Lu 1.0079 Lutetium	
Actinide series		89 Ac 227 Actinide	90 Th 232.04 Thorium	91 Pa 231.04 Protactinium	92 U 238.03 Uranium	93 Np 237 Neptunium	94 Pu 244 Plutonium	95 Am 243 Americium	96 Cm 247 Curium	97 Bk 247 Berkelium	98 Cf 251 Californium	99 Es 252 Einsteinium	100 Fm 257 Fermium	101 Md 258 Mendelevium	102 No 259 Nobelium	103 Lr 1.0079 Lawrencium	

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SPECIMEN

Sample Assessment Material

LEVEL 3 CAMBRIDGE TECHNICAL IN LABORATORY SKILLS

Unit 23: Scientific research techniques

MARK SCHEME

Duration: 2 hours

MAXIMUM MARK 60

SPECIMEN

Version: 1 **Date: 25/10/16**

This document consists of 9 pages

Question			Answer	Marks	Guidance
1	(a)		*Any two from:* Academic rigour eg peer reviewed / nature of institution;; Perspective eg. scientific, social, economic;; Bias eg.. vested interest / one-sided view / confirmation bias;;	2 + 2	Allocate 1 mark for named factor and 1 mark for suitable explanation/example. **Allow** any other relevant explanation.
	(b)		*Any two from:* Facts; Opinions; Supporting evidence; References;	2	
2	a		*Any three from:* **Feature** Not drawn according to convention; **Explanation** Does not represent the data in a logical order; **Feature** Sample size not stated; **Explanation** May not be a significant sample size; **Feature** Gender of population not known; **Explanation** Diseases may be linked to gender; **Feature** Age of population not known; **Explanation**	2 + 2	**Allow** any realistic feature with accompanying explanation.

Question			Answer	Marks	Guidance
			Diseases may be age-related;		
	b		*Any three from:* Sample size; Gender of population; Age of population Date of data collection; Location of data collection; Specific names of diseases eg. type of cancer/cardiovascular disease;	3	**Allow** any other realistic facts needed to make a conclusion.
3	**a**		(Fresh) orange juice and sweets; (contain the) same molecules **because** (they are the same colour);	2	**Allow** any appropriate wording within the hypothesis.
	b		*Any two from:* Orange juice and sweets are mentioned in the debate; Molecules (are also) mentioned in the debate; The hypothesis can be tested; The hypothesis does not include other facts/features;	2	Other factors = eg. Taste, state of matter etc.
	c		Chromatography / named example of chromatography;	1	
	d		*Any two from:* Separate (the molecules); Identify (the molecules); Quantify (the molecules);	2	
4	**a**		*Any four from (with ref. to source A);* No added disinfectants; Identified/protected source; Consistent in composition; Free from pollution;	4	**Allow** alternative wording.

Question			Answer	Marks	Guidance
			Characteristic stable composition; Microbiologically safe;		
	b		**Source A** *Any two OR three from;* (Biased towards) water companies/Thames Water; (Biased towards) water producers/ British Bottled Water; Water companies/producers make a profit from sale of bottled and tap water; Less reliable sources of information/commercial bias; **Source B** *Any two OR three from:* Based on legislation/regulations from government departments/ DEFRA; Based on Water Quality Standards (website); Independent/legislative organisations; Non-for-profit organisations; Reliable sources of information/non-commercial organisations;	5	**Allow** only max. 3 marks from each source.
	c		*Any five from:* (Drinking water) is essential for health; Can be used as part of a calorie controlled diet; Replacement for sugary soft drinks; Detox agent; Washing clothes/bathing; Industrial use; Commercial use; Reliable alternative to tap water (when tap water not available/reliable);	5	
	d	**i**	*Any three from:*	3	**Ignore** ref. to photographic – already in source material.

Question			Answer	Marks	Guidance
			Audio; Video; Digital;		**Allow** PowerPoint, animation, models, flow diagrams.
		ii	*Any three from:* Standard Analytical Practices; Health and Safety Procedures; Risk assessment; COSHH adherence; CLEAPS procedures;	3	**Allow** any correct descriptions of named examples. **Allow** > 1 names example for any of the practices/procedures listed.

5	**Report**		**Levels of Response** **Level 3** • 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	20	**Valid points** • **Explanation** of area of focus o is clear and concise. o may be expressed as question(s) to explore o related to the pre-released material o may be oppositional o may be a different slant • **Justification** o in relation to the pre-release

			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 • Many points are developed **[16 – 20 marks]** **Level 2** • 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		o in relation to own personal interest in the theme o in relation to another specific source o in relation to current/contemporary issues linked to the pre-release • **Reporting** of findings taking into consideration: o appropriate use of information/data o comparing and contrasting methods, results or findings o relevance and appropriateness of findings from information gathered o clear link and relevance to area of focus being researched o acknowledgement of sources o avoidance of plagiarism o consideration of any relevant ethical issues • **Evaluation** of research should aim to assess validity, reliability and generalizability related to the following: Method(s) chosen o quantitative and/or qualitative

			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 **[9 – 15 marks]** **Level 1** • 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		o primary and/or secondary o details of methods (e.g. survey, questionnaire, interview, literature review, etc…) o participants (where applicable) o ethical considerations Evidence generated o notes and records o types of data o selecting/collecting/interpreting relevant data, graphs and tables o 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) o appropriate referencing and acknowledgement of sources o advanced search tools and refining search data Source material(s) used o Identifying secondary sources: ▪ Library search carried out ▪ Lists the key terms used

			• 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 • 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 **[1 - 8 marks]** **Level 0** Candidate includes **fewer than two** valid points. **[0 marks]**		o Selecting secondary sources ▪ Appropriate ▪ Relevant ▪ Complimentary ▪ Trustworthy ▪ identifies possible bias ▪ strengths or limitations of research methods used ▪ ethics of the research ▪ representativeness of samples • **Conclusions** will bring together your key findings, your evaluation and relate them back to your focus and should: o be in relation to the area of focus/research question/hypothesis o make judgements on evidence/findings o use the information gathered o consider the validity, reliability and generalizability of the research conducted • Answer may assess implications of findings for:

					o individuals o groups o practitioners/professionals o practice o private, public, voluntary sectors o areas of policy o those who carry out research o particular areas of sport science and sport studies • Proposals for relevant areas for further research may include: o questions that have not been answered o areas where further evidence is needed o alternative research methods that could be used • Proposals should: o be plausible and realistic o build on current knowledge o relate to the focus and/or theme be linked to limitations identified
			Total	**60**	