

## Wednesday 20 January 2021 – Afternoon

### Level 3 Cambridge Technical in Applied Science

**05874** Unit 23: Scientific research techniques

**Time allowed: 2 hours**

**C344/2101**



**You must have:**

- the Insert
- a ruler (cm/mm)

**You can use:**

- a scientific or graphical calculator
- an HB pencil

Please write clearly in black ink.

Centre number

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Candidate number

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First name(s)

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Last name

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Date of birth

D	D	M	M	Y	Y	Y	Y
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### INSTRUCTIONS

- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Answer **all** the questions.
- Write your answer to each question in the space provided. If you need extra space use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- At the end of the exam, hand in your pre-release notes with your exam paper.

### INFORMATION

- The total mark for this paper is **60**.
- The marks for each question are shown in brackets [ ].
- This document has **12** pages.

### ADVICE

- Read each question carefully before you start your answer.

#### FOR EXAMINER USE ONLY

Question No	Mark
1	/4
2	/9
3	/7
4	/20
5	/20
<b>Total</b>	<b>/60</b>

Answer **all** the questions.

- 1 **Fig. 1.1** and **Fig. 1.2** are extracts from two scientific research studies investigating blood groups.

A 2011 Korean study concluded:

The results of the study show no relation between the blood type of the adult and their emotional character. However, meaningful difference has been revealed between the blood type and stress resistance. Type O rated higher scores in awareness and stress resistance than other types.

*Journal of the Korean Academic Society of Industrial Science  
(Vol. 12, No. 6) 2011, pp.2554-2560*

**Fig. 1.1**

A 2015 Japanese study concluded:

We observed a significant association between ABO blood group genotypes and personality traits in a large number of healthy Japanese subjects. However, these results should be regarded as preliminary and should be interpreted with caution...

*PLoS One. 2015; 10(5): e0126983. Published online 2015 May 15. doi: 10.1371/journal.pone.0126983*

**Fig. 1.2**

- (a) Write a hypothesis based on these conclusions **and** describe the outcome required to prove or disprove your hypothesis.

Hypothesis .....

.....

.....

Outcome .....

.....

.....

**[2]**

- (b) Suggest why the conclusions for the 2011 (**Fig. 1.1**) and 2015 (**Fig. 1.2**) research studies may be contradictory.

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**[2]**

2 One of the main human personality traits is conscientiousness.

Conscientiousness is defined as : **Strength of purpose and drive to goal accomplishment.**

A 2007 study investigated conscientiousness.

The authors of the study used a survey questionnaire to obtain data from respondents in different regions of the world.

(a) Which formats would the authors have used to obtain the most reliable data from their survey questionnaire?

Tick (✓) **three** boxes.

Formal	<input type="checkbox"/>
Informal	<input type="checkbox"/>
Structured	<input type="checkbox"/>
Unstructured	<input type="checkbox"/>
Verbal	<input type="checkbox"/>
Written	<input type="checkbox"/>

[3]

(b) Suggest how the design of the survey questionnaire enabled researchers to obtain numerical data.

.....  
.....  
.....[2]

(c) The study was published in a peer reviewed academic journal.

State **three** assumptions that can be made about the data obtained, that would support its validity.

1.....  
.....  
2.....  
.....  
3.....  
.....

[3]

- (d) The numerical data from the survey was used to calculate the mean 'Conscientiousness Levels (95% Confidence Interval)'.

Suggest what is meant by the term '95% Confidence Interval'.

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.....[1]

3 Mia is a buildings inspector.

She applies government building regulations to ensure that school buildings meet certain acoustic standards.

“Each room or other space in a school building shall be designed and constructed in such a way that it has the acoustic conditions and the insulation against disturbance by noise appropriate to its intended use.”

*Acoustic design of schools: performance standards  
Building bulletin 93 February 2015*

Mia measures the sound reduction index of building materials.

The sound reduction index is a measure of the level of sound insulation provided by structures such as walls, windows and doors.

(a) When selecting an appropriate technique for the measurement and calculation of the sound reduction index Mia considers:

- availability
- cost
- reliability

State **and** explain **three** other factors that Mia should also consider.

Factor 1 .....

.....

Explanation .....

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Factor 2 .....

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Explanation .....

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Factor 3 .....

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Explanation .....

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[6]

(b) State how government building regulations may be used as a secondary source.

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.....[1]

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

4 (a) Comment on sources A and B in relation to their academic rigour.

Source A

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Source B

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[6]

(b) Source A identifies benefits to the lungs, heart and blood circulation as a result of high-intensity impact training (HIIT).

Identify **three** other benefits of HIIT outlined in source A.

1.....

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[3]

(c) Discuss source **B** in relation to reliability and reproducibility.

Reliability

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Reproducibility

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[6]

(d) (i) With reference to source **B**, identify **three** standard analytical practices.

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2 .....

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3 .....

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[3]

(ii) With reference to source **B**, suggest **two** features of the risk assessment needed for the two experiments.

1 .....

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2 .....

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**[2]**



**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.

**[20]**

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A series of horizontal dotted lines for writing.

**END OF QUESTION PAPER**

## ADDITIONAL ANSWER SPACE

If additional answer space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s) – for example 1(a) or 2(b).

A large rectangular area with a solid vertical line on the left and horizontal dotted lines across the page, providing space for writing answers.



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