Oxford Cambridge and RSA

CAMBRIDGE TECHNICALS LEVEL 3 (2016)

Examiners' report

APPLIED SCIENCE

05847–05849, 05879, 05874

Cambridge TECHNICALS

Unit 3 Summer 2019 series

Version 1

Contents

Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates. The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

A full copy of the question paper can be downloaded from OCR.

Note to Centres: There were a number of centres who had selected an invalid combination of units or had claimed the wrong units for a student that prevented overall qualifications results being issued. Please note that it is the responsibility of the centre to check that correct units have been entered for certification claims. OCR cannot guarantee that the issuing of results in these circumstances will meet deadlines for UCAS confirmation.'

Sector Update: Two key changes have occurred in relation to the Level 3 Technicals qualifications, both in relation to the examined units; firstly, an additional re-sit has been allowed, so learners can have 2 further attempts at an examined unit if they wish to improve their result from the first attempt made. And secondly, a 'near pass' R grade has been introduced, which enables learners who do not pass but achieve sufficient marks to gain some points for their examined unit outcome, which may mean that it is not necessary to re-sit the exam.

Paper Unit 3 series overview

This is the fourth series for the Unit 3 (Scientific Analysis and Reporting) paper, and the third published Examiner's report for the unit.

To do well on this paper candidates need to be confident responding to questions on a wide range of scientific topics and confident in analysing data from unfamiliar contexts presented in novel formats. Those candidates who had been prepared well for the examination responded well to the combination of objective questions and open-response questions. Nearly all candidates were able to attempt all questions in the time available, and there were very few questions that were not attempted. Few candidates required the use of additional pages, other than to show working for Question 1(d).

Candidates who performed well on this paper were able to carry out calculations correctly without introducing arithmetic errors, were able to use scientific form confidently, work to a stated number of significant figures, and were able to analyse relevant data correctly.

Generally, candidates did not seem to have the skills necessary to construct graphs accurately with useable scales on the axes, to plot points accurately and draw lines/curves of best fit with a suitable level of competence (Question 2(a)), nor the understanding of how to construct a tangent to curve at a given point (Question 2(d)(i)) and how to derive the correct units for the gradient.

Centres are directed to the document *Cambridge Technicals Level-3 Applied Science: Unit 3 – Scientific analysis and reporting: Resource Links* available at https://www.ocr.org.uk/Images/314490-scientific-analysis-and-reporting.pdf which details links to resources which centres will find useful when teaching the content of this unit, including those topics identified as problematical in this report.

Question 1 (a)

1 A group of patients are anaemic.

They have regular blood tests to monitor the number of platelets in their blood.

The results of the blood tests are shown in **Table 1.1**.

Patient	Platelet count
1	105
2	92
3	81
4	86
5	110
6	98
7	101
8	92
9	92
10	83
11	102

Table 1.1

(a) Identify the mode of the platelet count in **Table 1.1**.

.... **[1]**

This question presented few problems to candidates.

Question 1 (b)

(b) Calculate the median of the platelet count in T**able 1.1**.

.... **[1]**

This question presented few problems to candidates.

Question 1 (c)

(c) Calculate the mean of the platelet count in **Table 1.1**.

Give your answer to **2** significant figures.

Show your working.

mean = ...**[2]**

Some candidates did not convert the calculated answer to two significant figures. Other candidates converted the calculated answer to two significant figures, but included trailing zeroes in the decimal portion (95.00), and so didn't appreciate that trailing zeroes in the decimal portion are significant.

Question 1 (d)

(d) The formula below can be used to calculate the standard deviation of the platelet count data in **Table 1.1**.

standard deviation $s = \sqrt{\frac{1}{N-1}\Sigma_{i=1}^{N} (x_i - \bar{x})^2}$

N is the number of blood tests to measure the platelet count

x_i is the platelet count

$\bar{x}$ is the mean platelet count calculated in **(c)**.

Use the formula above to calculate the standard deviation for the data in **Table 1.1**.

Give your answer to **1** decimal place.

Show your working.

standard deviation s = ...**[6]**

This question was intended to test the ability of candidates to work through the calculation of a standard deviation, not their ability to enter numbers into a calculator, hence the instruction to 'Show your working'. In future a penalty may be imposed on candidates who do not demonstrate their understanding of the calculation of standard deviation by showing working. In general, this question was answered well with the majority of candidates getting the correct answer; where candidates introduced errors they frequently worked through the rest of the calculation and obtained a significant numbers of marks for error carried forward. Some candidates overlooked the instruction to give the answer to one decimal place.

Question 1 (e) (i)

(e) (i) Calculate $\overline{x} + s$.

$\overline{x} + s$ = ... **[1]**

This question presented few problems to candidates.

Question 1 (e) (ii)

(ii) Calculate $\overline{x} - s$.

$\overline{x} - s$ = ... **[1]**

This question presented few problems to candidates.

Question 1 (e) (iii)

(iii) Use your answers to **(e)(i)** and **(e)(ii)** to determine the percentage of platelet counts that are within one standard deviation of the mean.

Show your working.

percentage of platelet counts within one standard deviation = ...% **[2]**

Only a small number of candidates understood that they were required to work out the number of platelet counts falling between the values calculated in 1(e)(i) and 1(e)(ii) and express this as a percentage of the total number of platelet counts. A common error was to express the value calculated in 1(e)(ii) as a percentage of that calculated in 1(e)(i).

Question 1 (f)

(f) The platelet count in **Table 1.1** is in an abbreviated form.

- A true platelet count is the number of platelets per microlitre of blood.
- A normal platelet count is 300 000 platelets per microlitre of blood.

Calculate the number of platelets in one litre of normal blood.

1 microlitre = 0.000001 litres

Give your answer in standard form.

number of platelets in one litre of normal blood = ...**[2]**

Many candidates struggled with the conversion between microliters and litres, either dividing the platelet count given by a factor 10^6 or multiplying by a factor of 10^{-6}. Some candidates were clearly uncomfortable working in standard form and preferred to work with a number of zeroes: at this level candidates should be confident with the use of standard form.

Question 2 (a)

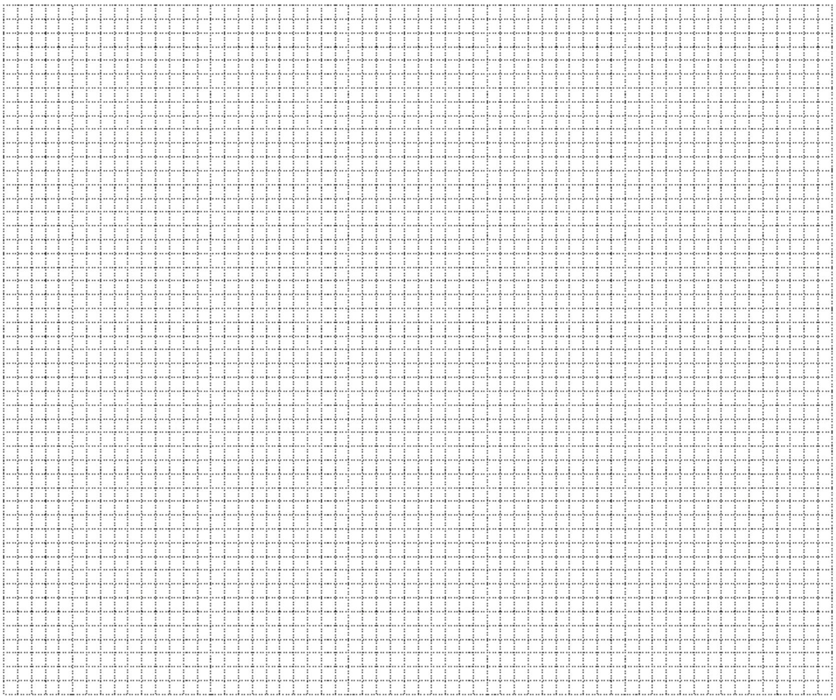
2 The concentration of sugar in the leaves of cereal plants varies with the time of day.

Table 2.1 shows results from an experiment analysing sugar concentration in leaves.

Time of day (h)	04:00	08:00	12:00	16:00	20:00
Sugar concentration (percentage of dry leaf mass)	0.44	0.70	1.75	2.00	1.40

Table 2.1

(a) Plot a graph of the results in **Table 2.1** and draw a curve of best fit.



[4]

A disappointing number of candidates made basic errors when constructing the graph: failure to rule axes; transposition of x and y axes; not including units for variables; choice of inappropriate scales which, while filling the grid provided, made plotting of points and reading off values difficult; not plotting points within half-a-square; and overly-thick or sketched lines of best fit. A significant number of candidates ignored the point at 20:00h.

i	**OCR support**	Guidance on graphical skills can be found within Appendix 6 of the OCR *Practical Skills Handbook* for each GCE A Level Science, available on the OCR website at https://ocr.org.uk/Images/294468-biology-practical-skills-handbook.pdf, https://ocr.org.uk/Images/208932-chemistry-practical-skills-handbook.pdf, and https://ocr.org.uk/Images/295483-practical-skills-handbook.pdf.

Question 2 (b)

(b) Use your graph to estimate the sugar concentration at 10:00.

sugar concentration = ... percentage of dry leaf mass **[1]**

Untidy drawing of the line of best fit resulted in some candidates being able to select more than one sugar concentration, while other candidates demonstrated a lack of care in reading the value from the y axis. Inappropriate choice of the scale for the y axis led to difficulties in identifying the correct value for a number of candidates.

Question 2 (c)

(c) Use your graph to predict the sugar concentration at 22:00.

sugar concentration = ... percentage of dry leaf mass **[1]**

Some candidates had constructed their graphs using a scale for the x axis which did not allow them to extend their line of best fit to 22:00h. Where candidates are required to construct graphs, they should read the question in its entirety to make sure that no extensions to the graph are required from which to extrapolate data. Extrapolation of the graph beyond 20:00h proved problematical for many candidates, who were unable to extend the line of best fit tidily and/or accurately. Untidy drawing of the line of best fit resulted in some candidates being able to select more than one sugar concentration, while other candidates demonstrated a lack of care in reading the value from the y axis. Inappropriate choice of the scale for the y axis led to difficulties in identifying the correct value for a number of candidates.

Question 2 (d) (i)

(d) **(i)** Calculate the gradient of the graph at 08:00.

Give the units.

Show your working.

gradient = ... units = ... **[4]**

Nearly all candidates demonstrated an understanding of how to determine the gradient of a graph by means of drawing a tangent to the curve. However, tangents drawn were often inappropriate, being to one or the other side of 08:00 rather than at 08:00; tangents were frequently inaccurately drawn, and/or drawn with thick lines, and/or far too small to be read accurately. Few candidates seemed to understand the derivation of the correct units when calculating the gradient of a graph. There was no error carried forward allowed for calculation of the gradient from the curve drawn by the candidate, this was to reflect the accuracy with which the curve had been drawn – candidates should practise their graph-drawing skills.

i	**OCR support**	Guidance on graphical skills can be found within Appendix 6 of the OCR *Practical Skills Handbook* for each GCE A Level Science, available on the OCR website at https://ocr.org.uk/Images/294468-biology-practical-skills-handbook.pdf, https://ocr.org.uk/Images/208932-chemistry-practical-skills-handbook.pdf, and https://ocr.org.uk/Images/295483-practical-skills-handbook.pdf.

Question 2 (d) (ii)

(ii) Describe how the gradient of the graph changes between 04:00 and 10:00.

....

....**[1]**

Nearly all candidates identified the increase in gradient, but many candidates were unable to express the idea of 'increase' succinctly, often resorting to tortuous language.

Question 2 (d) (iii)

(iii) Describe how the gradient of the graph changes between 12:00 and 16:00.

....

....**[1]**

Nearly all candidates identified the decrease in gradient towards zero, but many candidates were unable to express the idea of 'decrease' succinctly, and some referred – incorrectly – to a negative or declining gradient.

Question 3 (a)

3 Keys can be used for the identification of living organisms.

Table 3.1 shows some characteristics of native British plants.

Plant species	Form of reproduction	Presence of roots	Plant height (cm)	Other features
Selaginella kraussiana	Spore	No	15	Scale-like leaves
Equisetum telmateia	Spore	Yes	40	Fine grooves in stems
Equisetum palustre	Spore	Yes	60	Deep grooves in stems
Marchantia polymorpha	Spore	No	10	No true leaves
Lolium perenne	Seed	Yes	90	Hollow seeds, rounded stems
Agropyron repens	Seed	Yes	120	Hollow seeds, rounded stems
Carex capillaris	Seed	Yes	20	Solid seeds, 3-sided stems
Carex hirta	Seed	Yes	70	Solid seeds, 3-sided stems

Table 3.1

(a) **Fig. 3.1** shows a key to identify the different plant species in **Table 3.1**.

Use the data in **Table 3.1** to complete the blank spaces in the key.

Some of the key has already been completed.

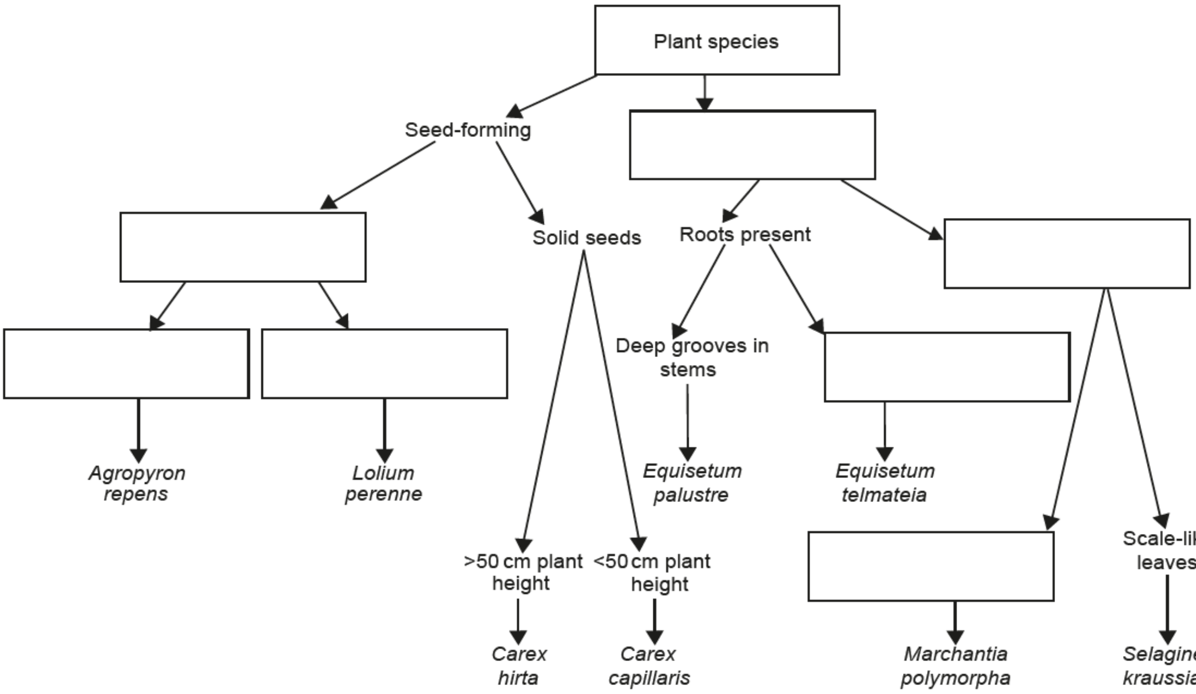


Fig. 3.1

[7]

Nearly all candidates scored high marks on this question, with many achieving full marks. Where errors were made these were commonly on the right hand side of the key, and reflected a lack of understanding that is a feature of the same characteristic that must be compared at each level.

Question 3 (b) (i)

(b) Plants are often known by their common names.

Horsetails, liverworts and mosses are the common names for three types of plant.

They produce spores during reproduction.

An example of each plant is shown in the photographs in **Fig. 3.2.**

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Horsetail	**Liverwort**	**Moss**

Fig. 3.2

(i) Draw a line from the Latin name to the common name to identify the plants.

Use the information in **Table 3.1**, **Fig. 3.1** and **Fig. 3.2** to help you.

Latin name	**Common name**
Equisetum palustre	Horsetail
Marchantia polymorpha	Moss
Selaginella kraussiana	Liverwort

[2]

The ability of some candidates to answer this question correctly was impaired through errors made in completing Fig. 3.1, but no error carried forward was allowed because the features in Fig. 3.2 would not then fully match Table 3.1 or Fig. 3.1. Many candidates were unable to correctly match the features described in Table 3.1 and/or Fig. 3.1 with the photographs in Fig. 3.2, suggesting a lack of development of observational skills.

Question 3 (b) (ii)

(ii) **Fig. 3.2** shows one type of primary data.

State another source of primary data to be used in the classification of plants.

.... **[1]**

In general candidates had a poor understanding of types of primary data, and many candidates produced extensive lists including many incorrect suggestions. Candidates should be aware that where a number of responses/examples is specified then penalties can be applied for any additional incorrect responses/examples offered. A significant number of candidates suggested photographs, overlooking the fact that Fig. 3.2 consisted of photographs, and the question had asked them to state another source of primary data. Sketches were not considered to be accurate enough to constitute primary data for use in classification; references to 'drawings'/'diagrams' were accepted, although no candidates referred to the use of scale in their production. No candidates suggested the use of DNA nucleotide sequencing.

Question 3 (c) (i)

(c) **(i)** Define the term **binomial nomenclature**.

....

....

.... **[2]**

Nearly all candidates understood that binomial nomenclature identifies the genus and species of an organism, but there were few references to it being a two-part name. Many candidates extended their answers to describe the benefits of binomial nomenclature in terms of classification, to little purpose as this detail was not asked for in the question.

Question 3 (c) (ii)

(ii) Suggest why binomial nomenclature is used in the classification of plants.

....

....

....

....

....

.... **[4]**

Very few candidates scored highly on his question. Responses tended to repeat the idea of identifying genus and species, without explaining the benefits in terms of formalising the naming of plants and providing a unique identification according to an internationally agreed code of rules which also shows phylogenetic relationships; explanations tended to focus on the international use of binomial nomenclature, but overlooked the need for an agreed code of rules.

Question 4 (a) (i)

4 Beth is investigating the time period for a simple pendulum (**Fig. 4.1**) to swing from left to right.

Image removed due to copyright restrictions

She records the time taken for the heavy pendulum bob to swing from a set point.

She repeats the swing four times for each of four experiments, **A**, **B**, **C** and **D**.

The results of her four experiments are shown in **Table 4.1.**

Experiment	Time period (s) for a simple pendulum			
	Repeat			
	1	**2**	**3**	**4**
A	48.5	53.0	49.5	51.0
B	45.6	47.0	45.0	46.5
C	45.5	46.2	54.5	48.5
D	50.5	51.0	50.0	49.5

Table 4.1

(a) The **true value** of the period of the pendulum is 50.5 s.

(i) Which experiment, **A**, **B**, **C** or **D**, is precise and accurate?

.... **[1]**

Question 4 (a) (ii)

(ii) Which experiment, **A**, **B**, **C** or **D**, is precise but **not** accurate?

.... **[1]**

Question 4 (a) (iii)

(iii) Which experiment, **A**, **B**, **C** or **D**, is accurate but **not** precise?

.... **[1]**

Question 4 (a) (iv)

(iv) Which experiment, **A**, **B**, **C** or **D**, is **not** precise or accurate?

.... **[1]**

Responses to Questions 4(a)(i) – 4(a)(iv) suggested that candidates have difficulty in identifying precision and accuracy in data, even though they may be able to correctly define the terms; there was no consistent pattern in the identification of precision in many candidates' responses. This unit requires candidates to be able to analyse data, including the identification of precision and accuracy alongside each other; candidates should be exposed to a wide variety of experimental data during the course and should develop the ability to critically evaluate such data.

Question 4 (b)

(b) Determine the range of the times recorded in Experiment **C**.

Show your working.

range = ... s **[2]**

This question presented few problems to candidates.

Question 4 (c)

(c) Suggest what Beth should specify to make her investigation **repeatable**.

....

....

....

....**[2]**

In general candidates demonstrated an inability to identify controlled variables, many referring to the need for 'a control' or repeat measurements. Creditworthy answers invariably referred to the length of the pendulum or the weight [sic] (rather than mass) of the pendulum bob; many candidates referred to the height of the pendulum swing, but this does not have the same meaning as amplitude.

Question 4 (d) (i)

(d) Time was measured in this investigation.

Beth started and stopped a stopwatch.

This introduced a source of error.

(i) Describe the **cause** of this error.

.... **[1]**

Few candidates specifically mentioned reaction time as the cause of the error, many referred instead to human error or simply repeated the stem of the question by stating that Beth manually started and stopped the stopwatch.

Question 4 (d) (ii)

(ii) What type of error is caused when a person starts and stops a stopwatch?

Tick (✓) **one** box.

Measurement error	☐
Random error	☐
Systematic error	☐

[1]

Very few candidates recognised that, the type of operator error described results in random errors, many candidates favouring measurement error. The identification of types of error and an understanding of how to correct or compensate for them remains problematical for many candidates.

Question 4 (d) (iii)

(iii) Explain your answer to **d(ii)**.

....

.... **[1]**

Few candidates were able to explain why they had selected the option in 4(d)(ii); regardless of the option selected the answer should have identified that the error was caused by the operator rather than by the equipment.

Question 4 (e) (i)

(e) The reading on a stopwatch lies between a minimum time value and a maximum time value.

The manufacturer states that the stopwatch has an accuracy of 0.3%.

The stopwatch shows a reading of 1000.0 s.

(i) Calculate the minimum and maximum time values.

minimum = ... s

maximum = ... s
[3]

This calculation proved problematical for the majority of candidates: candidates were unable to calculate a 0.3% error of 1000, as opposed to a 30% error.

Question 4 (e) (ii)

(ii) What **type** of error is due to the accuracy of the stopwatch?

Tick (✓) **one** box.

Measurement error ☐

Random error ☐

Systematic error ☐

[1]

Very few candidates recognised that instrument errors result in systematic errors, many candidates again favouring measurement error. The identification of types of error and an understanding of how to correct or compensate for them remains problematical for many candidates.

Question 5 (a)

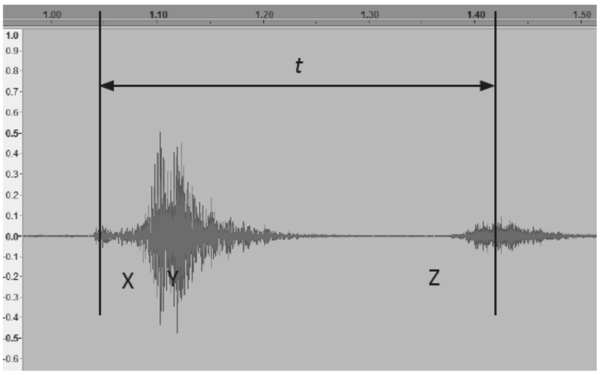
5 Amir is carrying out an investigation using voice recognition software to display sounds as wave forms on a computer screen.

He asks two of his friends to say a single-syllable word into a microphone.

Each wave form is recorded as a trace on the computer screen.

Fig. 5.1 shows the trace recorded for each of Amir's friends.

Trace 1



Trace 2

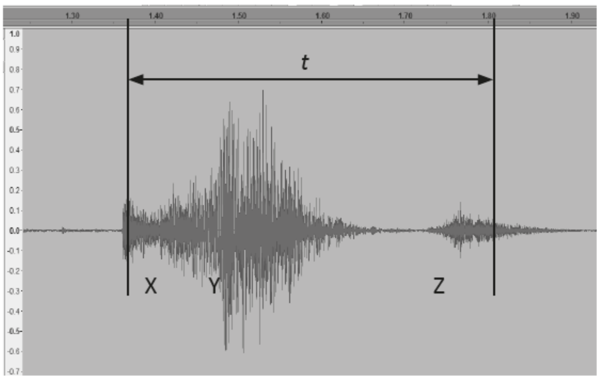


Fig. 5.1

(a) The horizontal axis of each trace shows the time taken to speak the single-syllable word.

Amir concludes that the same word was spoken by both of his friends.

Do you agree with Amir's conclusion?

Use **traces 1** and **2** to explain your answer.

....

....

....

....**[2]**

In general this question was answered well: candidates made a statement as to whether they agreed or disagreed with Amir and then made reference to t_1/t_2 and/or the pattern of the traces to justify their statement; few candidates, however, quoted values for t_1/t_2.

Question 5 (b)

(b) The voice recognition software used by Amir also gives a frequency analysis of each trace.

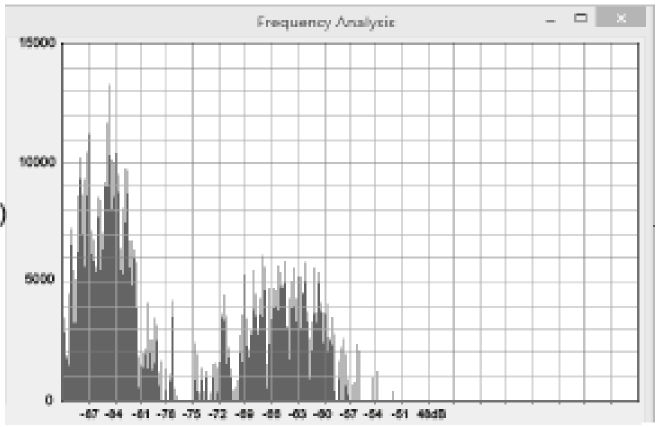
Frequency, in Hertz (Hz), is plotted against the loudness of the sound, in decibels (dB).

Amir recorded the frequency of the sounds produced by three different friends on a computer screen when they said the same word.

The results of the frequency analysis are shown as three traces in **Fig. 5.2.**

Trace 1

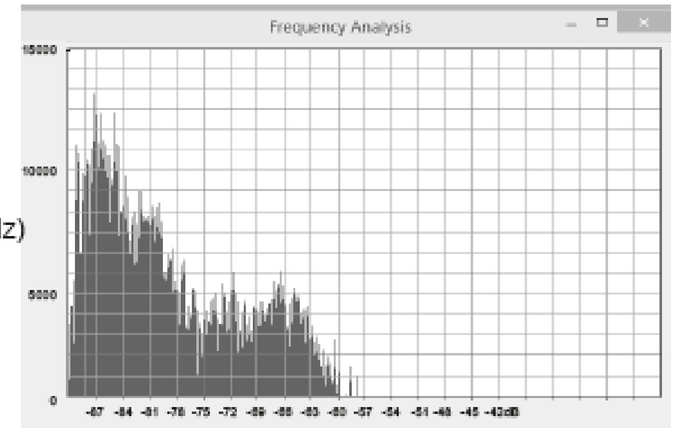
Frequency (Hz)



Loudness (dB)

Trace 2

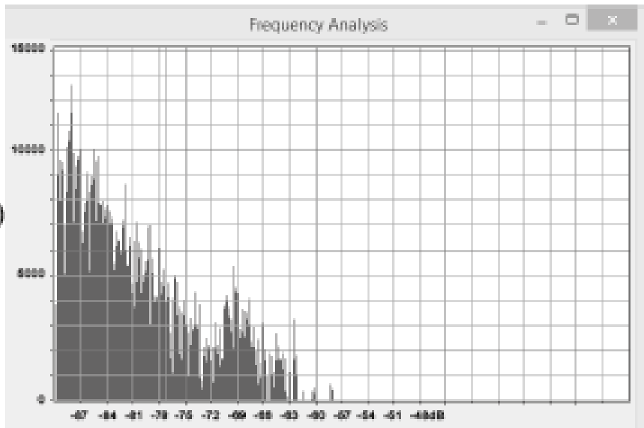
Frequency (Hz)



Loudness (dB)

Trace 3

Frequency (Hz)



Loudness (dB)

Fig. 5.2

Compare the three traces in **Fig. 5.2** to describe how they confirm that the same word was spoken and describe why the traces are not identical.

....

....

....

....

....

....**[6]**

The presentation of the data in this question appeared to confuse many candidates: some candidates – perhaps thinking back to the previous question – wrote about the change in frequency with time, of those candidates who correctly identified the variables as frequency and volume many struggled to explain the pattern of variation observed. Many candidates did not appreciate that the question was asking them to compare similarities in the traces to confirm that the same word was spoken and then to find reasons to justify why the traces might not be identical, these candidates sought to find differences in the traces and so scored Level-0. Other candidates compared similarities and differences in the traces without any justification, and were limited to Level-1. Of those candidates who did correctly answer the question by identifying similarities in the traces and then attempted to explain the differences few provided sufficient detail to justify the award of Level-3, nearly all being limited to marks within Level-2.

Question 5 (c) (i)

(c) The data shown in **Fig. 5.1** and **Fig. 5.2** are primary data.

(i) Describe **one** feature of primary and secondary data.

Primary data ....

....

Secondary data ....

....**[2]**

Few candidates were able to succinctly identify either of the key features of primary or secondary data. Many candidates produced extensive lists including many incorrect suggestions: candidates should be aware that where a number of responses/examples is specified then penalties can be applied for any additional incorrect responses/examples offered.

Question 5 (c) (ii)

(ii) Suggest **three** advantages of using secondary data.

1 ....

2 ....

3 ....
[3]

Most candidates identified the advantages of time and/or cost, but very few candidates made reference to either previous analysis/peer-review of data, the ability to compare data, or the potential to generate ideas for further investigation. Many candidates produced extensive lists of suggestions stretching across the three answer lines including many incorrect suggestions. Candidates should be aware that where a number of responses/examples is specified then penalties can be applied for any additional incorrect responses/examples offered.

Question 6 (a)

6 Scientific findings are shared with a wide range of people.

Scientific authors can be either public information scientists or scientific journalists.

(a) For each type of author in **Table 6.1** put a tick (✓) in the correct box to indicate if they are public information scientists or scientific journalists.

Type of author	Public information scientist	Scientific journalist
University scientist		
Scientific book authors		
Government scientific agencies		
Newspaper article authors		
Scientific companies		
TV programme producers		
Blog author		

Table 6.1

[7]

Nearly all candidates managed to confuse public information scientists and scientific journalists and miscategorised the types of author provided, scoring only 1 or 2 marks.

Question 6 (b)

(b) When writing a scientific report it is important to consider the audience that the report is written for.

Suggest **three** different audiences that scientific reports can be written for.

1 ....

2 ....

3 ....

[3]

In general, candidates did not identify different audiences; candidates tended to differentiate from within the general population audience (e.g., young/old/students/teachers). Many candidates produced extensive lists stretching across the three answer lines including many incorrect suggestions: candidates should be aware that where a number of responses/examples is specified, penalties can be applied for any additional incorrect responses/examples offered.

Question 7 (a) (i)

7 Iron tablets are used to treat people with a low level of iron in their blood.

The active ingredient in iron tablets is iron(II) sulfate, $FeSO_4$.

(a) Susan carries out a titration to check the mass of iron in an iron tablet.

She follows three key steps.

Step 1 - The iron tablet is ground to a fine powder using a pestle and mortar and transferred to a conical flask.

Step 2 - 100 cm^3 of dilute sulfuric acid is added to the powder, and then the flask is shaken until the iron tablet dissolves.

Step 3 - A few drops of indicator are added and the solution is titrated with 0.010 mol dm^{-3} potassium dichromate.

Susan records the initial and final burette readings as part of the titration, and calculates the volume needed to reach the end-point.

She obtains the results shown in **Table 7.1**.

Initial burette reading (cm^3)	0.10
Final burette reading (cm^3)	19.00
Volume of 0.010 mol dm^{-3} potassium dichromate added (cm^3)	18.90

Table 7.1

(i) Calculate the number of moles of potassium dichromate required to react with the iron in the tablet.

Use the equation: $\text{number of moles} = \dfrac{\text{concentration (mol dm}^{-3}) \times \text{volume (cm}^3)}{1000}$

number of moles = ... **[2]**

This question presented few problems to candidates.

Question 7 (a) (ii)

(ii) In the titration, 6 moles of iron(II) ions react with 1 mole of dichromate ions.

Calculate the number of moles of iron in the tablet.

Use your answer from **(a)(i)**.

number of moles = ... **[1]**

This question presented few problems to candidates.

Question 7 (a) (iii)

(iii) The relative atomic mass of iron is 55.8.

Calculate the mass, in mg, of iron in the tablet.

Use the equation: mass (g) = number of moles x relative atomic mass

Use your answer from **(a)(ii)**.

Give your answer to **3** significant figures.

mass of iron = ... mg **[4]**

This question presented few problems to candidates as far as step two. A significant number of candidates then did not convert g to mg, and this then caused problems when recording the answer to three significant figures as many candidates appeared to be unaware of the significance of leading zeroes.

Question 7 (a) (iv)

(iv) The bottle of iron tablets states that **each** tablet contains 65 mg.

Calculate the error in Susan's value from **a(iii)** as a percentage of the value shown on the bottle.

percentage error = ... % **[2]**

This question proved problematical for many candidates, who had little idea of how to attempt this standard calculation.

Question 7 (a) (v)

(v) Susan considers using a spectrophotometer to determine the mass of iron in the tablet.

Suggest **one** advantage and **one** disadvantage of using a spectrophotometer rather than completing a titration.

Advantage ....

....

Disadvantage..

.... **[2]**

The majority of candidates struggled to identify both an advantage and a disadvantage of using a spectrophotometer, but usually correctly identified a disadvantage. Disadvantages identified were invariably related to the costs of operating the machine or the trained personnel required to operate the machine. Very, very few candidates framed their answers around the relative analytical benefits/disadvantages of the two techniques.

Question 7 (b) (i)

(b) Chromatography can be used to purify (prepare) a chemical for further use or to quantify the amount of a chemical present.

(i) Complete the sentences below using words from this list.

Each word may be used once, more than once or not at all.

elution **protonometry** **scraping** **radiology** **nephrology**

Preparative samples can be obtained from column chromatography by

....

Preparative samples from thin layer chromatography (TLC) can be obtained by

.... or ....

[3]

The majority of candidates were able to select the correct responses from the list provided.

Question 7 (b) (ii)

(ii) Densitometry can be used to quantify the amount of substance separated on a TLC plate.

Complete the sentences below using words from this list.

Each word may be used once, more than once or not at all.

scanned	**intensities**	**less**	**protracted**	**cyclons**
greater	**calibration**	**wavelengths**	**similar**	

A beam of light is ………………….................... across the TLC plate.

Different chemicals absorb specific ………………….................... of light.

The more substance present, the ………………….................... the amount of light absorbed. The amount of substance present can be estimated by comparing the absorption of the spot with a ………………….................... graph.

[4]

The majority of candidates were able to select the correct responses from the list provided.

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