

Examiners' report

LEVEL 3 CERTIFICATE

CORE MATHS B (MEI)

**OCR Level 3 Certificate
in Core Maths B (MEI)**

H869

For first teaching in 2016

H869/01 Summer 2025 series

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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. A selection of candidate responses is also provided. 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.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.

A full copy of the question paper and the mark scheme can be downloaded from [Teach Cambridge](#).

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Paper 1 series overview

Most candidates were able to attempt all of the questions, giving them the opportunity to demonstrate what they could achieve.

The higher-scoring candidates found these items of content the most challenging:

- carrying out calculations involving large numbers (Question 1 (b))
- where the specific detail required was embedded within a question (Questions 4 (a) (i), 5 (c) (ii) and 5 (c) (iii)).

Competency was particularly evident when:

- providing reasoned conclusions or interpretations based on information provided or calculated (Questions 1 (b), 2 (a) (iii), 5 (b) (ii) and 6 (a) (iii))
- carrying out multi-calculation problem solving activities (Question 1 (b))
- creating simple spreadsheet formulae (Question 3 (c) (ii))
- calculating or estimating probabilities (Question 6 (b)).

The lower-scoring candidates found these pieces of content the most challenging:

- rounding to a specified degree of accuracy (Questions 6 (a) (i) and 6 (a) (ii))
- carrying out multi-calculation problem solving activities (Question 1 (b))

The examination instructions state: 'Give your final answers to a degree of accuracy that is appropriate to the context'. Notably, there is an expectation that money (£) should be given correct to two decimal places.

Other instances that may result in mark loss, essentially because of less successful technique rather than lack of knowledge and understanding, include:

- incomplete or ambiguous crossing out of work
- incorrect use or omission of units
- digits not clearly written, leading to ambiguous working and responses
- not reading what the question is asking for; an example of this is Question 1 (a) (iii): 'Determine if the campaign was worthwhile'. To gain the final mark, there must be a clear decision shown in response to the question.

The commentaries and exemplars that follow are applicable to both H868/01 and H869/01.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
• approached extended problem solving questions logically, and clearly presented their responses requiring reasoned conclusions and interpretations in Questions 1 (b), 2 (a) (iii), 5 (b) (ii) and 6 (a) (iii) • fully read and understood the question to make sure that their responses fully addressed the question asked in Questions 2 (a) (iii), 4 (a) (i) and 5 (c) (ii).	• did not apply logical processes to reach conclusions in extended problem solving in Question 1 (b) • did not provide a decision or reasoned explanation in Questions 1 (a) (iii), 2 (b) and 5 (b) (ii) • did not demonstrate an understanding of spreadsheet notation in Question 3 (c) (ii).

Question 1 (a) (i)

- 1 This question refers to article A in the pre-release material, '**Online advertising**'. You can find the article on the Insert accompanying this paper.

- (a) Yuki runs an online handmade jewellery business.
She has just finished an online advertising campaign.

The table shows a summary of the results from the campaign.

Impressions	100 000
Cost Per Mille (CPM)	£2.80
Click Through Rate	1.6%
Conversion Rate	0.5%

Cost Per Mille (CPM) means the price paid for a thousand **impressions** of the ad, as shown in article A.

- (i) Calculate the total cost of the campaign. [2]

Candidates generally answered this question well.

Question 1 (a) (ii)

- (ii) How many people clicked on the ad during the campaign? [1]

This question was generally answered well.

Question 1 (a) (iii)

- (iii) Yuki estimates that her average profit is around £35 for each online sale.

Determine if the campaign was worthwhile by considering the total cost of the campaign and the profit generated.

Show your working. [3]

Candidates generally answered this well. Where marks were lost, this was due to an incorrect calculation of the number of conversions or because candidates did not provide a decision as to whether the campaign was worthwhile.

Question 1 (b)

- (b) According to an online advertising agency, on average, each person in the UK over the age of 14 views over 5000 online ads a day.

Show that the information below does **not** support this claim.

- Annual spend on online advertising on over 14s in the UK is about £12 billion.
- The average CPM is £3.50 for this spend.
- There are 55.7 million over 14s in the UK.
- About 50% of impressions result in a view.

One billion is a thousand million.

[4]

Approaches to this question varied, with some candidates attempting to calculate the number of views for each person over the age of 14 and some opting to calculate the cost of the campaign based on 5000 views per day. Both approaches were successful. Where marks were lost, this was often due to errors in calculations relating to billions or millions.

Assessment for learning



Candidates should have a clear understanding of methods of working with large numbers and the relationship between millions and billions.

OCR support



Section check in tests feature questions on a single section of the specification and can be used as formative assessments.

For support with standard form and working with large numbers, download the [Exponentials section check in test](#) from Teach Cambridge.

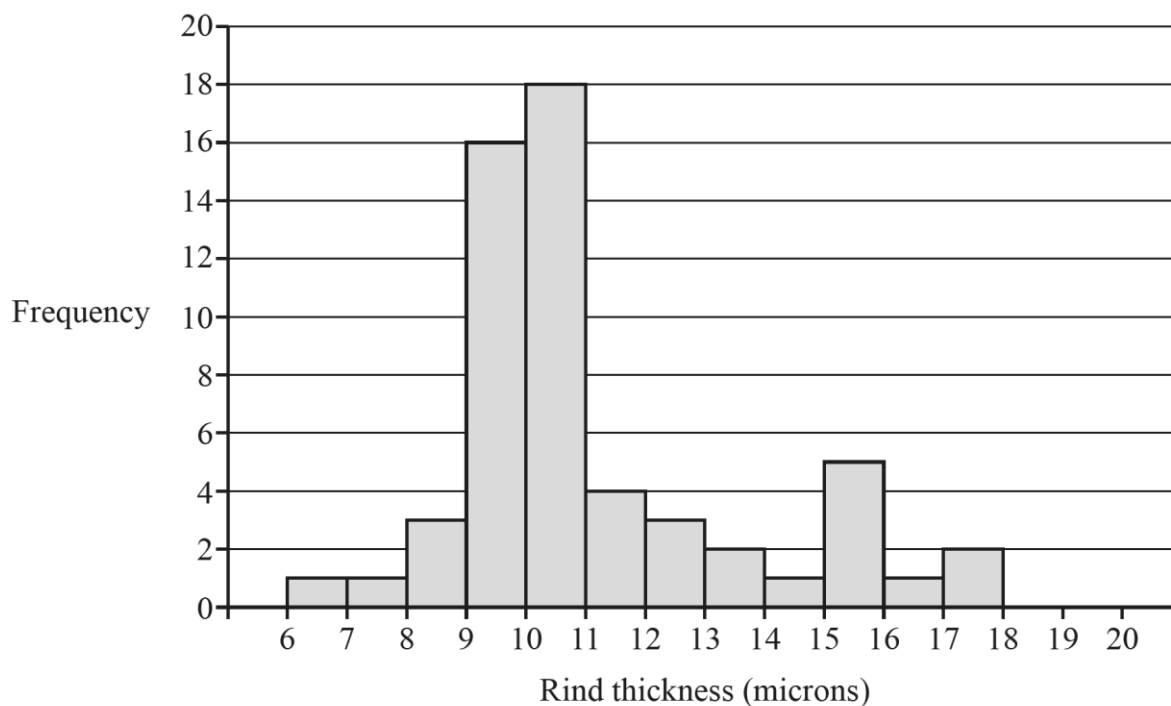
Question 2 (a) (i)

- 2 This question refers to article B in the pre-release material, '**Obsidian Rind**'.
You can find the article on the Insert accompanying this paper.

- (a) **Fig. 2.1** shows the rind thicknesses measured on 57 stone tools from a region of California in America.

No stone tools were found to have a rind thickness less than 6 microns.

Fig. 2.1



- (i) How many of the stone tools had a rind thickness of 15 microns or more? [1]

Candidates generally answered this question well by interpreting the data in the chart.

Question 2 (a) (ii)

- (ii) In this region of California, 1 micron of rind took 300 years to form.

Estimate how long ago the people who made the tools last lived in the region.

[2]

Candidates generally answered this well. Where marks were lost, candidates had calculated a range of times rather than the requested 'last lived'.

Exemplar 1

2(a)(ii)	57 stone tools · 1 took 300 years to form.
	Highest to Rind thickness: 18 microns.
	18×300
	$= 5400.$

In this exemplar, the candidate has based their calculation on the maximum rind thickness. This would identify when tools were first made and, potentially, when people first lived in the region.

Question 2 (a) (iii)

- (iii) State a further conclusion that can be made using Fig. 2.1 about the people who lived in this region.

Justify your conclusion using information from Fig. 2.1.

[2]

Many candidates provided conclusions relating to tools rather than people. In many cases, there was a lack of understanding of the difference between a conclusion and a justification.

Exemplar 2

2(a)(iii)	Conclusion
	most obsidian made tools were made 2700 - 3300
	years ago
	Justification
	There is the highest frequency of tools with the rind
	thickness between 9 - 11µm. $9 \times 300 = 2700$ and $11 \times 300 = 3300$

This response focuses entirely on the age of the tools and makes no reference to the people who lived in the region.

Question 2 (b)

- (b) Ages estimated using obsidian rind thicknesses have a large measure of uncertainty, which can be up to $\pm 25\%$.

Obsidian rind dating estimates the age of an arrowhead found in another region of America as 15 200 years.

The oldest evidence of humans in this part of America is 12 600 to 13 000 years old (and was dated by other, more accurate, methods).

Explain whether the arrowhead's estimated age is consistent with this evidence. [2]

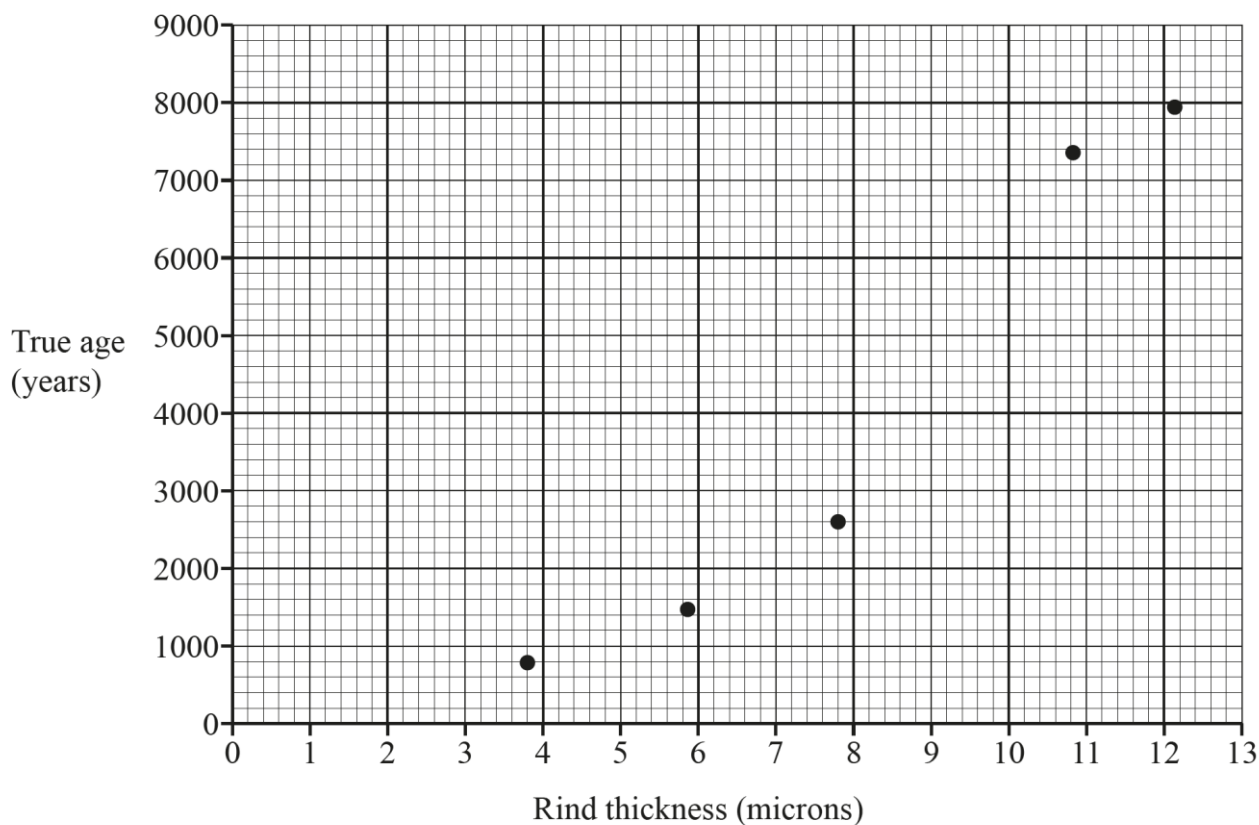
In many cases, marks were lost due to applying the $\pm 25\%$ margin of error to the dates of humans rather than the estimation of obsidian rind dating.

Question 2 (c) (i)

- (c) **Fig. 2.2** shows a scatter graph of the rind thicknesses of some obsidian tools plotted against their true ages.

These obsidian tools were collected in the coastal area of Peru.

Fig. 2.2



- (i) Draw a line of best fit for the 5 points on **Fig. 2.2**.

[1]

This was generally answered well. Where the mark was lost, it tended to be that the candidate had not appreciated the need to ensure a balance of readings on both sides of the line or curve.

Question 2 (c) (ii)

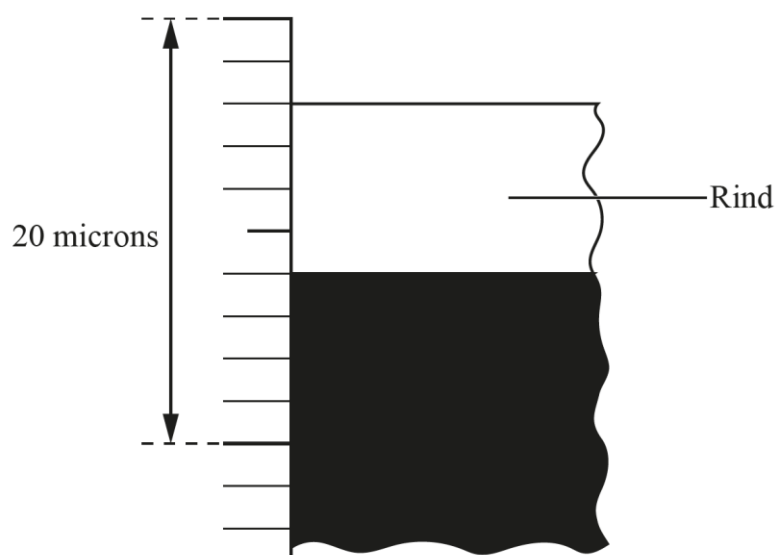
- (ii)** **Fig. 2.3** shows the magnified image of the cross-section of an obsidian hand axe.

Calculate an estimate of the age of the hand axe.

Use your line of best fit from **(c)(i)**.

[2]

Fig. 2.3



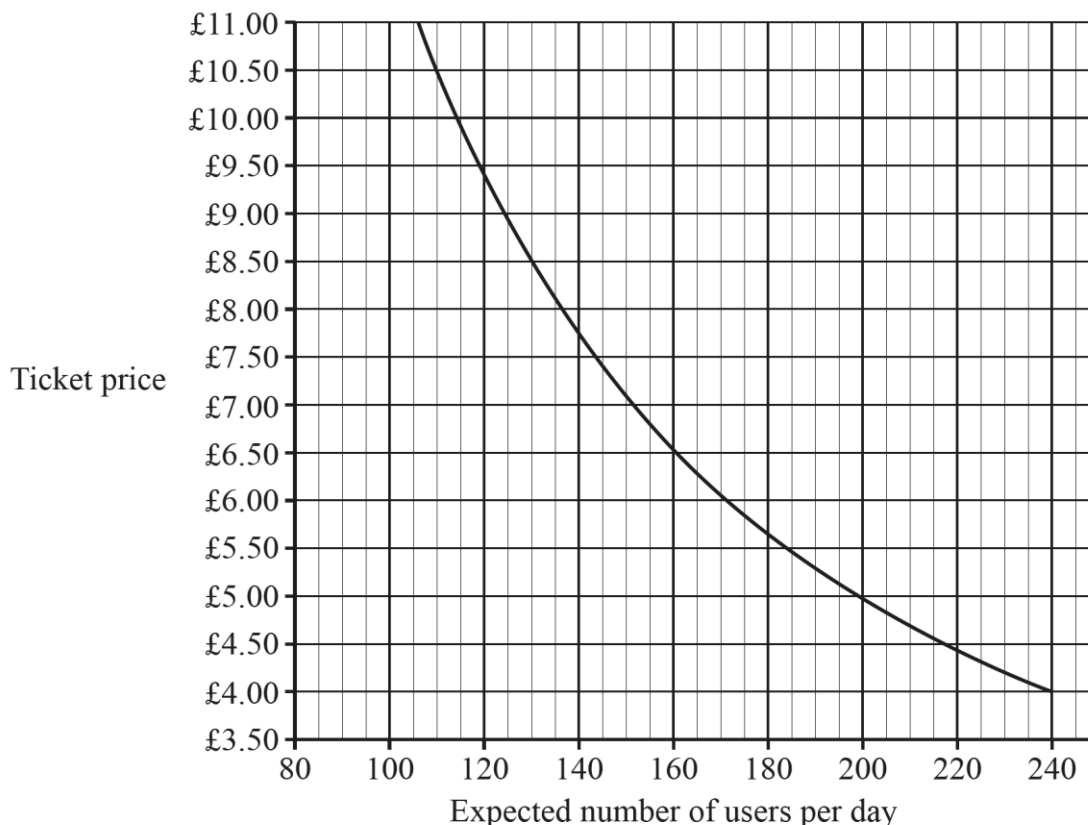
Where marks were lost, these tended to be either the incorrect calculation of the rind thickness or by the use of a calculation, rather than their line of best fit, to estimate the age.

Question 3 (a) (i)

- 3 In a Park and Ride scheme, people park their car outside a town and then take a bus into the town. The ticket they buy includes both parking and a bus journey to the town and back. A town council is considering introducing a Park and Ride scheme to help reduce traffic and pollution in the town.

Fig. 3.1 shows a demand curve for Park and Ride ticket prices between £4 and £11.

Fig. 3.1



- (a) (i) How many users, to the **nearest 5 users**, can the town council expect per day if the ticket price is £6?

[1]

Candidates generally answered this question well.

Question 3 (a) (ii)

- (ii) Explain whether halving the ticket price always doubles the expected number of users per day.

Use information from **Fig. 3.1** to support your answer.

[3]

This was generally well answered. Where marks were lost, this was usually as a result of not providing a decision as to whether halving ticket prices always doubles the number of users.

Question 3 (b) (i)

- (b) The town council uses information from **Fig. 3.1** to calculate the predicted daily revenue for each ticket price, as shown in **Fig. 3.2**.

- (i) Fill in the **two** missing numbers in **Fig. 3.2**.

[2]

3(b)(i)

Fig. 3.2

Ticket price	Expected number of users per day (to the nearest 5)	Predicted daily revenue
£9.50	120	£1140
£9.00		

Candidates generally answered this question well.

Question 3 (b) (ii)

- (ii) The town council needs to choose what ticket price to set.

The town council have these criteria:

- Ticket prices can be set in multiples of **£0.50 only**.
- The town council needs at least £1100 daily revenue to make the Park and Ride viable.
- The town council wants as many people as possible to use the Park and Ride each day.

Determine the ticket price that the council should set.

You can use the blank copy of the table from **Fig. 3.2** which is in the answer space below.

[3]

Responses to this question varied, with many candidates demonstrating full understanding. Where marks were lost, this was often due to a lack of accurate supporting calculations.

Question 3 (c) (i)

- (c) A member of the town council suggests an equation that estimates daily revenue:

$$R = 721 \times t^{0.2}$$

where

R is the predicted daily revenue,

t is the ticket price.

- (i) The council member claims that the equation gives results within $\pm 2\%$ of the predicted daily revenue calculated using the demand curve.

Show that this claim is **correct** for the ticket price of £9.50.

Use the information in **Fig. 3.2**.

[4]

In many cases, marks were lost due to applying the $\pm 2\%$ margin of error to use of the formula rather than the data extracted from the demand curve.

Question 3 (c) (ii)

- (ii) **Fig. 3.3** shows part of a spreadsheet which uses the council member's equation from part (c)(i) to estimate the predicted daily revenue.
The ticket price is increased in £0.50 steps, starting from £4.25.

The starting value in A2 is entered manually.

Formulae are used to calculate the values in A3 and B2 which are both then copied down to the rows below.

Fig. 3.3

	A	B
1	Ticket price (£)	Revenue (£)
2	4.25	962.9706502
3	4.75	984.6320922
4	5.25	1004.539747
5	5.75	1022.983982

Write down the formula in cell A4 **and** the formula in cell B4.

[2]

This question was generally not well answered. Many candidates did not include spreadsheet notation in their responses.

Exemplar 3

3(c)(ii)	Cell A4: $= A3 + 0.50$
	Cell B4: $= (A4 \wedge 0.2) \times 721$

In this exemplar, the candidate has, correctly, used the '=', '+' and '^'. However, 'x' has been used to indicate multiplication rather than '*'.

OCR support



Practical spreadsheet activities to develop understanding of simple formulae can be downloaded from Teach Cambridge:

[Notes on the pre-release data set](#)

Question 4 (a) (i)

- 4 Trees capture carbon dioxide (CO_2) by photosynthesis. The amount of CO_2 captured or emitted is measured in tonnes.

- (a) Fig. 4.1 shows the **cumulative** CO_2 captured in tonnes to 2 decimal places as a willow tree ages.

Fig. 4.1

Tree age	CO_2 (tonnes)	Tree age	CO_2 (tonnes)	Tree age	CO_2 (tonnes)	Tree age	CO_2 (tonnes)	Tree age	CO_2 (tonnes)
0	0.00	10	0.05	20	0.19	30	0.44	40	0.81
1	0.00	11	0.06	21	0.21	31	0.47	41	0.85
2	0.00	12	0.07	22	0.23	32	0.50	42	0.89
3	0.01	13	0.08	23	0.25	33	0.54	43	0.94
4	0.01	14	0.10	24	0.28	34	0.57	44	0.99
5	0.02	15	0.11	25	0.30	35	0.61	45	1.04
6	0.02	16	0.12	26	0.33	36	0.64	46	1.09
7	0.03	17	0.14	27	0.35	37	0.68	47	1.14
8	0.03	18	0.16	28	0.38	38	0.72	48	1.19
9	0.04	19	0.17	29	0.41	39	0.76	49	1.25

A small wood has 8 willow trees growing in it.
These trees are all 37 years old.

- (i) Calculate how many tonnes of CO_2 these 8 willow trees captured in total over the past year.

[1]

While a large number of candidates answered this question correctly, most did not appreciate that the required calculation was for only one year rather than 37.

Question 4 (a) (ii)

- (ii) **One** of these 37-year-old willow trees is burnt down.
When a tree is burnt, all its captured CO_2 is emitted back to the atmosphere.

Calculate the net CO_2 capture or emission of the 8 willow trees over the past year. [2]

A significant number of candidates did not gain full marks on this question as they did not specify whether the figure provided for net CO_2 was an emission or a capture.

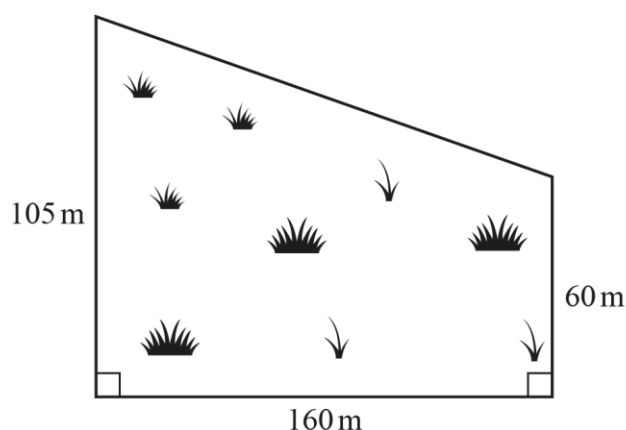
Question 4 (b) (i)

- (b)** London Plane trees, when mature, are good at capturing CO_2 .

A town council is planning to create a woodland populated with London Plane trees.

Fig. 4.2 shows the design of the planned woodland.

Fig. 4.2



- (i)** Each London Plane tree needs 400 m^2 of space.

The council will plant as many London Plane trees as possible in the woodland.

One mature London Plane tree can capture up to 0.03 tonnes of CO_2 a year.

Calculate the total number of tonnes of CO_2 that the London Plane trees in the woodland will capture each year, once mature. **[3]**

Responses to this question generally achieved maximum marks. Where marks were lost, this was as a result of an incorrect calculation of the area of the woodland.

Question 4 (b) (ii)

- (ii)** A typical petrol-driven car:
- is driven 11 910 km each year
 - uses 5.7 litres of petrol per 100 km driven
 - produces 0.0023 tonnes of CO_2 for each litre of petrol used.

Estimate the annual CO_2 emissions, in tonnes, for a typical petrol-driven car.

Show all your calculations and approximations. **[4]**

Responses to this question were generally correct. Where marks were lost, this was as a result of an incorrect calculation of the litres of petrol used, or because candidates did not appreciate that the question required an estimation or approximation.

Question 4 (b) (iii)

- (iii) Explain whether the planned woodland of London Plane trees is likely to be effective in reducing the amount of CO₂ in the region around the woodland.

Use your answers to parts (b)(i) and (b)(ii) to support your answer.

[1]

Candidates generally answered this question well, although a number did not appreciate that the calculation of CO₂ emitted related to only one car.

Question 5 (a) (i)

- 5 This question refers to article C in the pre-release material, '**Just noticeable differences (JND)**'. You can find the article on the Insert accompanying this paper.

A snack company wants to reduce the salt in their products. The company wishes to reduce salt gradually so that their customers do **not** notice the reduction.

The company uses Just Noticeable Differences (JNDs) for saltiness to help them do this.

- (a) Salt concentration is the stimulus in this situation.
Salt concentration is measured as the number of grams of salt dissolved in one litre of water.

Fig. 5.1 shows some test results and the corresponding Weber fractions, W , calculated using the formula

$$W = \frac{J}{x}$$

where

x is the initial salt concentration,

J is the Just Noticeable Difference in salt concentration.

- (i) Calculate the Weber fraction, W , that is missing from **Fig. 5.1**.

[1]

5(a)(i)

Fig. 5.1

Initial salt concentration (x grams/litre)	JND from initial salt concentration (J grams/litre)	Weber fraction, W (2 decimal places)
29.22	5.26	0.18
17.53	3.68	0.21
11.66	2.21	0.19
5.84	1.86	0.32
2.92	0.49	0.17
1.46	0.26	

This was generally well answered.

Question 5 (a) (ii)

- (ii) Calculate an appropriate average that could be used as a representative value for the Weber fraction.

You should:

- consider potential outliers
- explain your method.

[2]

Candidates generally answered this question well, although a significant number did not achieve full marks because they did not explain their method of calculation.

Question 5 (a) (iii)

- (iii) As part of the tests, it is decided to investigate salt concentration using two solutions of different strengths:
- 29.22 grams/litre (29.22 g of salt in 1 litre) and
 - 17.55 grams/litre (17.55 g of salt in 1 litre).

To do this a mixture is made up from:

- 0.15 litres of the 29.22 grams/litre solution and
- 0.14 litres of the 17.55 grams/litre solution.

What is the concentration of this mixture?

[3]

Responses to this question varied, with some candidates obtaining maximum marks. Where marks were lost, this was due to a lack of understanding that the required answer related to the overall mixture rather than the number of grams of salt included.

Question 5 (b) (i)

- (b) The company's Salt and Vinegar crisps have a particularly high salt content.
- Saltiness (the stimulus in this situation) is measured as the number of grams of salt in a 28 g packet of crisps.
 - Tests with the crisps on customers gives a Weber fraction, W , of 0.11.
 - Customers adjust to a reduced level of salt in crisps after a month.

The company adjust the saltiness of the crisps every month so that the saltiness, S , that does **not** taste any less salty than the previous month is given by:

$$S = 1.3 \times (1 - W)^n$$

where

n is the number of months after starting to reduce the salt content,

W is the Weber fraction.

Fig. 5.2 shows some values of S up to month 10.

- (i) Complete **Fig. 5.2** to show the saltiness at the start and after 10 months.

[2]

5(b)(i)	Fig. 5.2 <table border="1" data-bbox="448 1003 1278 1729"> <thead> <tr> <th>Months after starting to reduce salt content</th><th>Saltiness of crisps to 2 dp (grams per 28 g packet)</th></tr> </thead> <tbody> <tr> <td>0 (start)</td><td></td></tr> <tr> <td>1</td><td>1.16</td></tr> <tr> <td>2</td><td>1.03</td></tr> <tr> <td>3</td><td>0.92</td></tr> <tr> <td>4</td><td>0.82</td></tr> <tr> <td>5</td><td>0.73</td></tr> <tr> <td>6</td><td>0.65</td></tr> <tr> <td>7</td><td>0.58</td></tr> <tr> <td>8</td><td>0.51</td></tr> <tr> <td>9</td><td>0.46</td></tr> <tr> <td>10</td><td></td></tr> </tbody> </table>	Months after starting to reduce salt content	Saltiness of crisps to 2 dp (grams per 28 g packet)	0 (start)		1	1.16	2	1.03	3	0.92	4	0.82	5	0.73	6	0.65	7	0.58	8	0.51	9	0.46	10	
Months after starting to reduce salt content	Saltiness of crisps to 2 dp (grams per 28 g packet)																								
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6	0.65																								
7	0.58																								
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9	0.46																								
10																									

Responses to this question generally achieved maximum marks. Where marks were lost, this was as a result of not calculating the saltiness of crisps at the start (Month 0).

Question 5 (b) (ii)

- (ii) Explain if the salt content of the crisps can be reduced by 50% of its initial level within 4 months without customers being aware of any reduction in saltiness. [2]

Although many candidates demonstrated appropriate calculations, marks were lost by either not providing a conclusion or by providing a conclusion which was not consistent with their calculations.

Question 5 (c) (i)

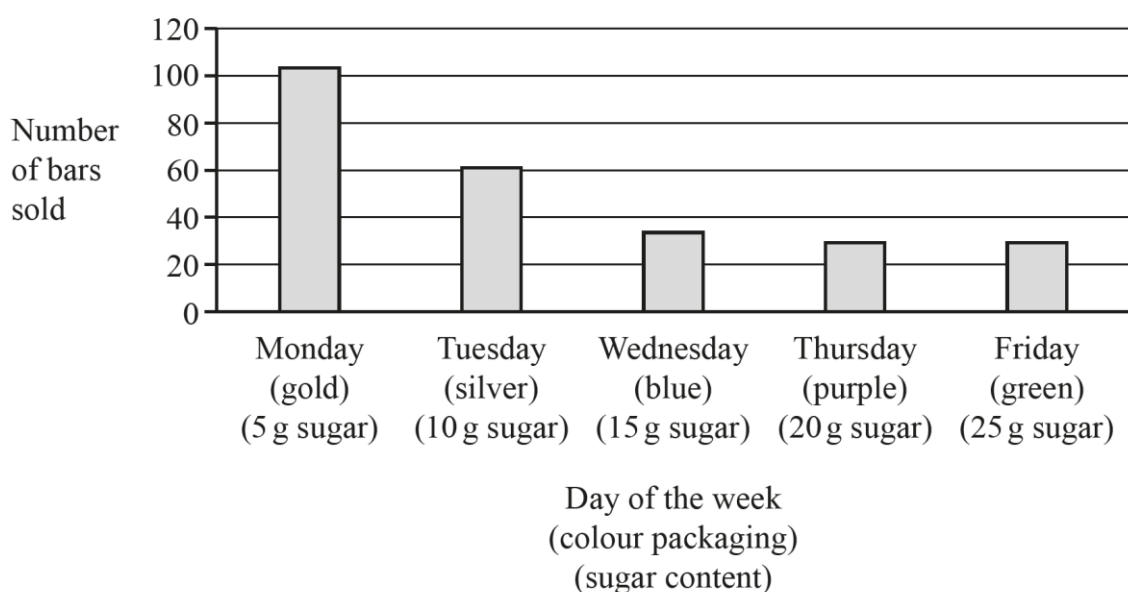
- (c) The company also sells 'healthy bars' for vending machines in schools. The company does an experiment to see whether they would sell more bars if the bars had a higher sugar content.

The company's experiment has these steps:

1. Select one of the schools the company supplies at random.
2. Do **not** tell any school staff or students about the experiment.
3. Choose a particular bar type for the experiment.
4. Set the sugar content of the bars at 5 g for Monday. Increase this by 5 g each day.
5. Wrap the bars in a different colour each day, as shown in **Fig. 5.3**.
6. Record the number of bars sold for each sweetness (or colour) bar.

Fig. 5.3 shows the results of the experiment.

Fig. 5.3



- (i) Explain briefly why the company's experiment might be considered unethical.

[1]

This question was correctly answered by the majority of candidates with reference to the lack of awareness of the experiment or potential health issues.

Question 5 (c) (ii)

- (ii) Using the chart in **Fig. 5.3** the company make the following conclusion.

‘Far from people preferring a sweeter bar, they prefer bars which are less sweet.’

Give **two other** possible explanations for the results shown in **Fig. 5.3**.

[2]

Responses varied, with a number of explanations relating to the sweetness, although the question specified ‘other explanations’. In a number of cases, the two responses given were similar, e.g. ‘they like gold wrappers’ and ‘they do not like green wrappers’.

Question 5 (c) (iii)

- (iii) Give **one** reason why it is **not** possible for the company to use this experiment to decide whether increasing the sugar content of bars would lead to them selling more bars. [1]

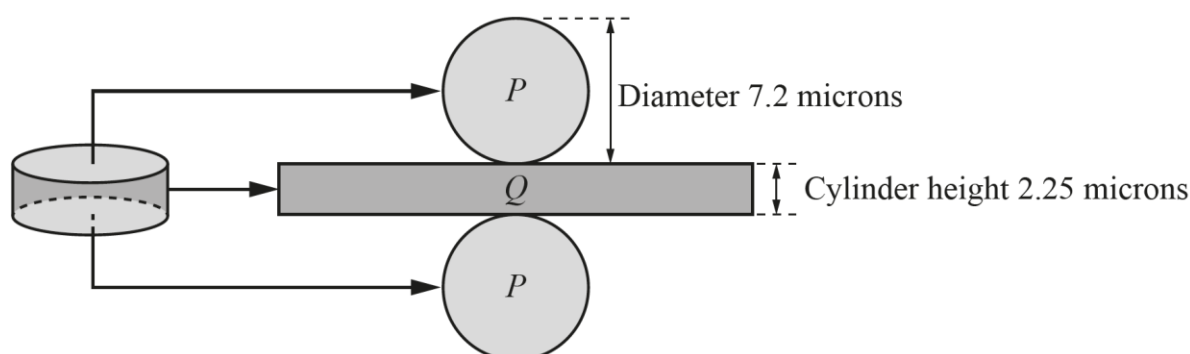
While the majority of responses were appropriate, a number referenced liking/disliking the level of sweetness.

Question 6 (a) (i)

- 6 This question refers to article D in the pre-release material, ‘**Blood**’.
You can find the article on the Insert accompanying this paper.

- (a) **Fig. 6.1** shows a red blood cell modelled as a thin cylinder.
 P is the area of each of the two circular end regions.
 Q is the area of the curved side.

Fig. 6.1



- (i) Calculate the value of P .

Give your answer to the **nearest microns²**.

[2]

Candidates generally answered this question well. Where marks were lost, this was usually due to not rounding to the degree of accuracy specified in the question.

Question 6 (a) (ii)

- (ii)** Calculate the value of Q .

Give your answer to the **nearest microns²**.

[2]

This was generally answered well. Where marks were lost, this was usually due to candidates not rounding to the degree of accuracy specified in the question.

Question 6 (a) (iii)

- (iii)** The surface area of an actual red blood cell is 136 microns².

Use your answers to **(a)(i)** and **(a)(ii)** to explain whether the model above gives a close estimate of the surface area of a red blood cell.

[2]

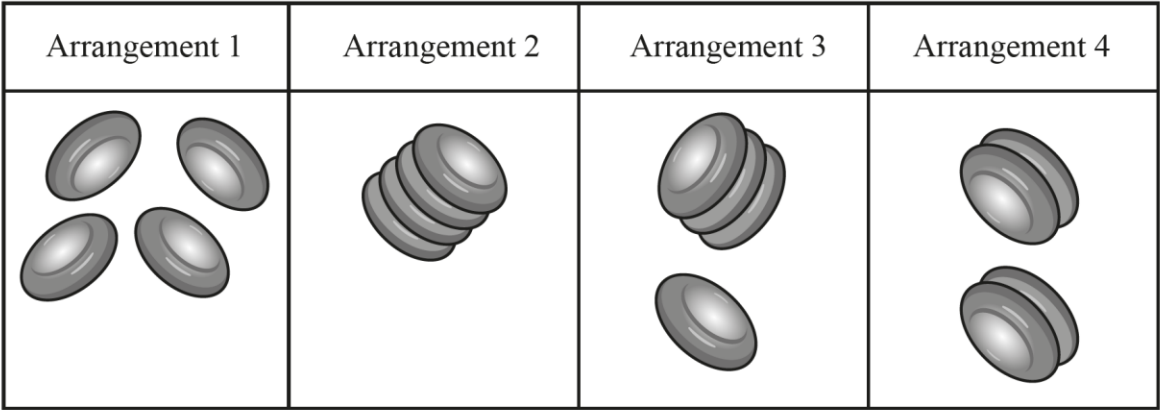
Although many candidates provided appropriate responses, marks were lost either by not providing a conclusion or by providing a conclusion without supporting figures.

Question 6 (a) (iv)

Red blood cells can stick together to form clusters. The effective area of a group of cells is the surface area of the cells that comes into contact with plasma.

Fig. 6.2 shows four ways that four red cells can be arranged.

Fig. 6.2



(iv) Complete **Fig. 6.3** by writing expressions for the effective areas of arrangements 3 and 4.

Model each red blood cell as a cylinder with surface area $2P + Q$. [2]

6(a)(iv)	Fig. 6.3		
		Arrangement	Effective surface area, S , in terms of P and Q
		1	$(2P + Q) + (2P + Q) + (2P + Q) + (2P + Q) = 8P + 4Q$
		2	$P + P + 4Q = 2P + 4Q$
		3	
		4	

This question was correctly answered by the majority of candidates.

Question 6 (a) (v)

- (v) A large effective surface area is important because it enables a greater amount of oxygen to be absorbed.

Make **one** observation about how the effective surface area of a group of four red blood cells is affected by different arrangements.

Use the information in **Fig. 6.3**.

[1]

This question was correctly answered by the majority of candidates.

Question 6 (b)

- (b) **Fig. 6.4** shows which blood groups can donate blood to other blood groups.

Fig. 6.4

People with group O blood can donate to all blood groups.
 People with group A blood can donate to blood groups A and AB.
 People with group B blood can donate to blood groups B and AB.
 People with group AB blood can only donate to blood group AB.

Fig. 6.5 shows the blood groups of the patients at a health centre.

Fig. 6.5

	Patients' blood group				
	O	A	B	AB	Total
Male	2058	1836	471	212	4577
Female	2171	1918	463	252	4804
					9381

A new patient joins the health centre.
 The new patient is blood group B.

Calculate the probability that this new patient is able to donate to another patient selected at random from the other patients at the health centre.

Give your answer as a fraction.

[3]

This question was correctly answered by many candidates. Where marks were lost, this was often due to the inclusion of the new patient in the calculations, whereas the question states 'other patients'.

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