

Level 3 Certificate

Mathematics

H868/01: Introduction to Quantitative Reasoning

OCR Level 3 Certificate Core Maths A (MEI)

Mark Scheme for June 2025

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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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MARKING INSTRUCTIONS

PREPARATION FOR MARKING RM ASSESSOR

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM Assessor Online Training: OCR Essential Guide to Marking*.
2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are available in RM Assessor
3. Log-in to RM Assessor and mark the **required number** of practice responses (“scripts”) and the **required number** of standardisation responses.

MARKING

1. Mark strictly to the mark scheme.
2. Marks awarded must relate directly to the marking criteria.
3. The schedule of dates is very important. It is essential that you meet the RM Assessor 50% and 100% (traditional 40% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone, email or via the RM Assessor messaging system.
5. **Crossed-Out Responses**
Where a candidate has crossed out a response and provided a clear alternative then the crossed-out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed-out response where legible.

Rubric Error Responses – Optional Questions

Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM Assessor, which will select the highest mark from those awarded. (*The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.*)

Multiple-Choice Question Responses

When a multiple-choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate).

When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.

Contradictory Responses

When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

Short Answer Questions (requiring only a list by way of a response, usually worth only one mark per response)

Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

Short Answer Questions (requiring a more developed response, worth two or more marks)

If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space).

Longer Answer Questions (requiring a developed response)

Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there, then add the annotation 'SEEN' to confirm that the work has been seen and mark any responses using the annotations in section 11.

7. There is a NR (**No Response**) option. Award NR (No Response):

- if there is nothing written at all in the answer space
- OR if there is a comment which does not in any way relate to the question (e.g., 'can't do', 'don't know')
- OR if there is a mark (e.g., a dash, a question mark) which is not an attempt at the question.

Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

8. The RM Assessor **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response: Not applicable in F501

To determine the level – start at the highest level and work down until you reach the level that matches the answer

To determine the mark within the level, consider the following

Descriptor	Award mark
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

11. Annotations

Annotation	Meaning
✓ and ✕	
BOD	Benefit of doubt
FT	Follow through
ISW	Ignore subsequent working
M0, M1	Method mark awarded 0, 1
A0, A1	Accuracy mark awarded 0, 1
B0, B1	Independent mark awarded 0, 1
SC	Special case
^	Omission sign
MR	Misread
Highlighting	

Other abbreviations in mark scheme	Meaning
E1	Mark for explaining
U1	Mark for correct units
G1	Mark for a correct feature on a graph
M1 dep*	Method mark dependent on a previous mark, indicated by *
cao	Correct answer only
oe	Or equivalent
rot	Rounded or truncated
soi	Seen or implied
www	Without wrong working

12. Subject Specific Marking Instructions

- a. Annotations must be used during your marking. For a response awarded zero (or full) marks a single appropriate annotation (cross, tick, M0 or ^) is sufficient, but not required.

For responses that are not awarded either 0 or full marks, you must make it clear how you have arrived at the mark you have awarded and all responses must have enough annotation for a reviewer to decide if the mark awarded is correct without having to mark it independently.

It is vital that you annotate standardisation scripts fully to show how the marks have been awarded.

Award NR (No Response)

- if there is nothing written at all in the answer space and no attempt elsewhere in the script
- OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
- OR if there is a mark (e.g. a dash, a question mark, a picture) which isn't an attempt at the question.

Note: Award 0 marks only for an attempt that earns no credit (including copying out the question).

If a candidate uses the answer space for one question to answer another, for example using the space for 8(b) to answer 8(a), then give benefit of doubt unless it is ambiguous for which part it is intended.

- b. An element of professional judgement is required in the marking of any written paper. Remember that the mark scheme is designed to assist in marking incorrect solutions. Correct solutions leading to correct answers are awarded full marks but work must not always be judged on the answer alone, and answers that are given in the question, especially, must be validly obtained; key steps in the working must always be looked at and anything unfamiliar must be investigated thoroughly. Correct but unfamiliar or unexpected methods are often signalled by a correct result following an apparently incorrect method. Such work must be carefully assessed. When a candidate adopts a method which does not correspond to the mark scheme, escalate the question to your Team Leader who will decide on a course of action with the Principal Examiner.

If you are in any doubt whatsoever you should contact your Team Leader.

- c. The following types of marks are available.

M

A suitable method has been selected and applied in a manner which shows that the method is essentially understood. Method marks are not usually lost for numerical errors, algebraic slips or errors in units. However, it is not usually sufficient for a candidate just to indicate an intention of using

some method or just to quote a formula; the formula or idea must be applied to the specific problem in hand, e.g. by substituting the relevant quantities into the formula. In some cases the nature of the errors allowed for the award of an M mark may be specified.

A method mark may usually be implied by a correct answer unless the question includes the DR statement, the command words “Determine” or “Show that”, or some other indication that the method must be given explicitly.

A

Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. Accuracy marks cannot be given unless the associated Method mark is earned (or implied). Therefore M0 A1 cannot ever be awarded.

B

Mark for a correct result or statement independent of Method marks.

E

A given result is to be established or a result has to be explained. This usually requires more working or explanation than the establishment of an unknown result.

Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored. Sometimes this is reinforced in the mark scheme by the abbreviation isw. However, this would not apply to a case where a candidate passes through the correct answer as part of a wrong argument.

- d. When a part of a question has two or more ‘method’ steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. (The notation ‘dep*’ is used to indicate that a particular mark is dependent on an earlier, asterisked, mark in the scheme.) Of course, in practice it may happen that when a candidate has once gone wrong in a part of a question, the work from there on is worthless so that no more marks can sensibly be given. On the other hand, when two or more steps are successfully run together by the candidate, the earlier marks are implied and full credit must be given.
- e. The abbreviation FT implies that the A or B mark indicated is allowed for work correctly following on from previously incorrect results. Otherwise, A and B marks are given for correct work only – differences in notation are of course permitted. A (accuracy) marks are not given for answers obtained from incorrect working. When A or B marks are awarded for work at an intermediate stage of a solution, there may be various alternatives that are equally acceptable. In such cases, what is acceptable will be detailed in the mark scheme. If this is not the case please, escalate the question to your Team Leader who will decide on a course of action with the Principal Examiner.

Sometimes the answer to one part of a question is used in a later part of the same question. In this case, A marks will often be 'follow through'. In such cases you must ensure that you refer back to the answer of the previous part question even if this is not shown within the image zone. You may find it easier to mark follow through questions candidate-by-candidate rather than question-by-question.

- f. We are usually quite flexible about the accuracy to which the final answer is expressed; over-specification is usually only penalised where the scheme explicitly says so.
- When a value is given in the paper only accept an answer correct to at least as many significant figures as the given value.
 - When a value is not given in the paper accept any answer that agrees with the correct value to 3 s.f. unless a different level of accuracy has been asked for in the question, or the mark scheme specifies an acceptable range.
- NB for Specification B (MEI) the rubric is not specific about the level of accuracy required, so this statement reads "2 s.f".

Follow through should be used so that only one mark in any question is lost for each distinct accuracy error.

Candidates using a value of 9.80, 9.81 or 10 for g should usually be penalised for any final accuracy marks which do not agree to the value found with 9.8 which is given in the rubric.

- g. Rules for replaced work and multiple attempts:
- If one attempt is clearly indicated as the one to mark, or only one is left uncrossed out, then mark that attempt and ignore the others.
 - If more than one attempt is left not crossed out, then mark the last attempt unless it only repeats part of the first attempt or is substantially less complete.
 - if a candidate crosses out all of their attempts, the assessor should attempt to mark the crossed out answer(s) as above and award marks appropriately.
- h. For a genuine misreading (of numbers or symbols) which is such that the object and the difficulty of the question remain unaltered, mark according to the scheme but following through from the candidate's data. A penalty is then applied; 1 mark is generally appropriate, though this may differ for some units. This is achieved by withholding one A or B mark in the question. Marks designated as cao may be awarded as long as there are no other errors.
- If a candidate corrects the misread in a later part, do not continue to follow through. Note that a miscopy of the candidate's own working is not a misread but an accuracy error.
- i. If a calculator is used, some answers may be obtained with little or no working visible. Allow full marks for correct answers, provided that there is nothing in the wording of the question specifying that analytical methods are required such as the bold "In this question you must show detailed

reasoning”, or the command words “Show” or “Determine”. Where an answer is wrong but there is some evidence of method, allow appropriate method marks. Wrong answers with no supporting method score zero. If in doubt, consult your Team Leader.

- j. If in any case the scheme operates with considerable unfairness consult your Team Leader.

Question			Answer	Marks	AO	Guidance	Grade
1	(a)	(i)	$100\,000 \div 1000$ soi	M1	2		E
			$100 \times £2.80 = £280$	A1 [2]	1		E
1	(a)	(ii)	$100\,000 \times 0.016 = 1600$ (people clicked through)	B1 [1]	1		E
1	(a)	(iii)	1600 people clicked through so $1600 \times 0.005 = 8$ sales	M1	2	Accept <i>their</i> 1600 based on response to 1(a)(ii)	C
			The sales are worth $8 \times £35 = £280$ profit	A1	1	CAO	E
			Cost was £280 – so zero net profit	B1 [3]	3	1 for net profit based on <i>their</i> £280 cost – <i>their</i> £280 with justification ALLOW reference to the effect that Pat's has made herself visible online as a positive.	E

Question			Answer	Marks	AO	Guidance	Grade														
1	(b)		£3.50 buys 1 000 impression so £12 000 000 000 buys £12 000 000 000 × 1000 ÷ 3.5 = 3.42(857) × 10 ¹² or 3 428 571 428 571. ...) or 3.4 million million impressions oe	B1	2	<table border="1"><tr><td>CPM</td><td>£3.50</td></tr><tr><td>Annual</td><td>3428571428571.43</td></tr><tr><td>Impressions per person</td><td>61554.24</td></tr><tr><td>Impressions per person per day (365 year)</td><td>168.64</td></tr><tr><td>Impressions per person per day (365.25 year)</td><td>168.5263372</td></tr><tr><td>Views per person per day 365 year</td><td>84.32088312</td></tr><tr><td>Views per person per day 365.25 year</td><td>84.26316862</td></tr></table>	CPM	£3.50	Annual	3428571428571.43	Impressions per person	61554.24	Impressions per person per day (365 year)	168.64	Impressions per person per day (365.25 year)	168.5263372	Views per person per day 365 year	84.32088312	Views per person per day 365.25 year	84.26316862	A
		CPM	£3.50																		
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Views per person per day 365 year	84.32088312																				
Views per person per day 365.25 year	84.26316862																				
	This works out at this number of annual impressions per person: (3.4×10 ⁶ ×10 ⁶) ÷ (55.7×10 ⁶) = 61554. (...)	M1	2	This may be implied by the correct number of views per person (= 61554. (...) ÷ 2 = 30777	C																
	≈ 61554. (...) ÷ 365 ≈ 168 or 170 impressions per person per day	A1	2	ALLOW 365.25 days in a year. (= 168.526 ...)	E																
	≈ 168 or 170 impressions which is 84 or 85 views - a lot less than the 5 000 stated	B1	3	ALLOW 1 for clear reasoned conclusion which could be comparing views per day to 5000 or working out views per year and comparing (if working with impressions only, need to explicitly recognise that impressions > viewings in their reasoning)	E																

Question			Answer	Marks	AO	Guidance	Grade
			ALTERNATIVE METHOD 5000x365 = 1825000 (views per annum)	B1	1		
			1825000÷1000x3.5 = (£)6387.50 pa	M1	1		
			6387.5 x 55.7m = (£)355755900000	A1	1		
			Exceeds budget of £12 billion	B1	1		
				[4]			

Question			Answer	Marks	AO	Guidance	Grade
2	(a)	(i)	(5+1+2=) 8 (samples)	B1 [1]	1		E
2	(a)	(ii)	(The rind thickness is) 6 (micron) So age is $6 \times 300 = 1800$ (years old)	B1 B1 [2]	3 2	1 condone 6 micron $\leq$ thickness < 7 micron so 1 <i>their</i> 6 micron (within range 5-20) $\times$ 300 correct	E A
2	(a)	(iii)	Conclusion: a significant population or activity occurred in the region around 2700 to 3300 years ago (BP). Justification: The majority of the tools (16 + 18 = 34 tools) have rind thicknesses between 9 and 11 microns	B1 B1 [2]	3 3	Do not accept answers from 2(a)(ii) Conclusion MUST relate to people not tools Must include evidence from the graph, e.g. (There are fewer tools with rind thicknesses greater than 12 microns, indicating that) the earliest inhabitants of the region were fewer in number or less active in toolmaking compared to the period 2700 to 3300 years ago.	A A

Question			Answer	Marks	AO	Guidance	Grade
2	(b)		Given the $\pm 25\%$ accuracy in 15 200 years youngest arrowhead age $15\,200 \times 0.75 = 11\,400$ years old	B1	3	Seen or implied	A
			Other object is 12 600 to 13 000 years old so it could be the same age, there is an overlap between the lower end of the arrowhead's age range (11 400 years) and the upper end of the objects' age range (13 000 years).	B1	3	Dependent on first mark Allow a correct sketch showing the intervals (no explicit comment needed this case) Condone statement to the effect that $11\,400 < 12\,600$	A
				[2]			
2	(c)	(i)	Correct line of best fit,	B1	1	1 for line drawn within overlay– but gains no credit for evidence of a ruler drawn straight line segment between two points starting at (0,0) or a curve joining all points. ALLOW a curve.	C
				[1]			
2	(c)	(ii)	Rind is 8 (micron) From the graph, age is to an accuracy of ± 200	B1 B1FT	2 2	Seen or implied their 8 micron from their straight or curved line drawn on the scatter graph	E C
				[2]			

Question			Answer	Marks	AO	Guidance	Grade																				
3	(a)	(i)	170 (users will pay £6 for a ticket)	B1 [1]	2		E																				
3	(a)	(ii)	Choosing one pair of ticket prices with a factor two difference in price and finding the number of users in each case ALTERNATIVELY Choosing one pair of users with a factor 2 difference numbers and finding the prices in each case	B2	3,3	1 for each correct number of users in a pair. for example <table><tr><th colspan="2">Ticket prices (£)</th><th colspan="2">Users</th></tr><tr><td>11</td><td>5.5</td><td>105</td><td>185</td></tr><tr><td>10</td><td>5</td><td>115</td><td>200</td></tr><tr><td>9</td><td>4.5</td><td>125</td><td>220 or 215</td></tr><tr><td>8</td><td>4</td><td>135</td><td>240</td></tr></table>	Ticket prices (£)		Users		11	5.5	105	185	10	5	115	200	9	4.5	125	220 or 215	8	4	135	240	E
			Ticket prices (£)		Users																						
11	5.5	105	185																								
10	5	115	200																								
9	4.5	125	220 or 215																								
8	4	135	240																								
			No. Halving ticket prices does not double the number of users oe.	B1 [3]	3	ALLOW just “no” if supported by correct working	C																				
3	(b)	(i)	<table><tr><td>Ticket price</td><td>Number of users (to the nearest 5)</td><td>Predicted daily revenue</td></tr><tr><td>£9.50</td><td>120</td><td>£1140</td></tr><tr><td>£9.00</td><td><u>125</u></td><td><u>(£)1125</u></td></tr></table>	Ticket price	Number of users (to the nearest 5)	Predicted daily revenue	£9.50	120	£1140	£9.00	<u>125</u>	<u>(£)1125</u>	B1 B1FT	2 1	125 Revenue = <i>their</i> 125 × £9.00	E E											
			Ticket price	Number of users (to the nearest 5)	Predicted daily revenue																						
			£9.50	120	£1140																						
£9.00	<u>125</u>	<u>(£)1125</u>																									
			[2]																								

Question			Answer	Marks	AO	Guidance	Grade																		
3	(b)	(ii)	At least two correct trials	B2	2,2	1 for each correct row (maximum of two)	E																		
						<table><tr><th>Cost</th><th>Users</th><th>Revenue</th></tr><tr><td>11.00</td><td>105</td><td>1155.00</td></tr><tr><td>10.50</td><td>110</td><td>1155.00</td></tr><tr><td>10.00</td><td>115</td><td>1150.00</td></tr><tr><td>8.50</td><td>130</td><td>1105.00</td></tr><tr><td>8.00</td><td>135</td><td>1080.00</td></tr><tr><td>7.50</td><td>145</td><td>1087.50</td></tr></table>	Cost	Users	Revenue	11.00	105	1155.00	10.50	110	1155.00	10.00	115	1150.00	8.50	130	1105.00	8.00	135	1080.00	7.50
Cost	Users	Revenue																							
11.00	105	1155.00																							
10.50	110	1155.00																							
10.00	115	1150.00																							
8.50	130	1105.00																							
8.00	135	1080.00																							
7.50	145	1087.50																							
			£8.50 is the ticket price that fits	B1 [3]	3		A																		
3	(c)	(i)	Revenue = $721 \times t^{0.2}$																						
			= $721 \times 9.5^{0.2}$																						
			= $721 \times 1.56(871 \dots)$	B1	1	1.56(871 ...) seen or implied	E																		
			= 1131.(045...)	B1	1	$721 \times \textit{their}$ 1.56(871 ...) correct Condone answers in range 1124.76 – 1131.045	E																		
			$\frac{(1140 - 1131.045\dots) \times 100}{1140}$	B1	2	Condone (1131.045... - 1140) seen or implied	C																		
			= 0.7855 ... (%)			Condone $\frac{1131(.045\dots)}{1140} \times 100 = 99.2$	A																		
			which is less than 2(%)	B1 [4]	3	99.2 < 98																			
3	(c)	(ii)	=A3+0.5	B1	1	Condone =Sum(A3+.05)	E																		
			=721*(A4^0.2)	B1	1	Condone =721*A4^0.2 (valid keyed-in in Excel) Condone =Sum(721*(A4^0.2))	C																		
				[2]																					

Question			Answer	Marks	AO	Guidance	Grade
4	(a)	(i)	(8 willow 37 year old capture) $(0.68 - 0.64) \times 8 = 0.32$ (tonnes of CO ₂)	B1 [1]	2	Condone using 38 years (0.32 (tonnes))	E
4	(a)	(ii)	(Net carbon dioxide capture in 2024 =) $0.32 - 0.68$ which is a net 0.36 tonnes of CO ₂ emitted back into the atmosphere.	B1 B1 [2]	2 2	1 for <i>their</i> $0.32 - 0.72 = -0.4$ (condone 0.4 (tonnes)) 1 for <i>their</i> 0.4 emitted or captured (stated)	C E
4	(b)	(i)	Area of parkland = 13200 m^2 Number of trees = $13200 \div 400 = 33$ 33 trees can capture 33×0.03 tonnes = 0.99 (tonnes of CO ₂)	B1 B1 B1 [3]	1 2 2	Condone lack of units 1 for correct <i>their</i> $13200 \div 400$ soi 1 for correct <i>their</i> number of trees $\times 0.03$	C E E

Question			Answer	Marks	AO	Guidance	Grade
4	(b)	(ii)	Petrol used in a year = 119.1×5.7				E
			= 678.87	M1	2	Appropriate rounding could include $\approx 120 \times 6$ = 720 litres	C
			Which produces 678.87×0.0023 tonnes CO_2	M1	1	Any appropriate multiplication demonstrated $\approx 720 \times 0.002$ or 700×0.002 or 720×0.0025	C
			= 1.44 tonnes or 1.4 or 1.56 tonnes or 1.8 1 or 2 tonne of carbon dioxide	A1	2		A
			Evidence of rounding or approximation used and calculations carried out	B1	2	Final answer MUST be rounded to 0, 1 or 2 dp	
				[4]			
4	(b)	(iii)	The woodland in total can capture about 1 tonne of carbon dioxide less than or about the same pollution produced by a single car in a car. So woodland will not have a significant effect.	B1	3	1 for sensible comparison using <i>their</i> stated calculated figures in 4(b)(i) and 4(b)(ii).	C
				[1]			

Question			Answer	Marks	AO	Guidance	Grade
5	(a)	(iii)	Total amount of salt in the two solutions $(0.15 \times 29.22) + (0.14 \times 17.55)$ $= 4.383 + 2.457$ $= 6.84 \text{ (g)}$	B1	2	1 for correct value of $\frac{\text{their } 6.84}{\text{their } 0.29}$ 1dp or 2dp SC3 for $\frac{0.15 \times 29.22 + 0.14 \times 17.55}{0.15 + 0.14} =$ 23.59 or 23.6	A
			Total volume of the two solutions $= 0.15 + 0.14$ $= 0.29 \text{ (l)}$	B1	2		A
			Concentration of the mixture $= \frac{6.84}{0.29} = 23.59 \text{ or } 23.6 \text{ (l)}$	B1	2		A
				[3]			
5	(b)	(i)	Start = 1.30 (g per 28 g packet)	B1	1	Condone 1.3	C
			10th month = 0.41 (g per 28 g packet)	B1	1	Condone 0.405	E
				[2]			

Question			Answer	Marks	AO	Guidance	Grade
5	(b)	(ii)	50% is $1.3 \div 2 = 0.65$ (g per 28 g packet)	M1	2	ALLOW $0.88^4 = 0.599$	E
			Which is not till the 6th month, so no OR After 4 months it's still over 50%, so no.	A1	3	ALLOW 0.599 still nearly 60%	E
				[2]		A response of No, month 4 is still over 50% or does not reach 50% until month 6 with appropriate calculation would be awarded M1 A1 SC1 If no marks awarded and if first line is not completed in table in 5(b)(i) if Month 1 (1.16) is used giving 7 months	
			Alternative method After 4 months saltiness is 0.82 This is only $\frac{0.82}{1.3} \times 100$ or about 63%	M1	2		
				A1	3		
				[2]			
5	(c)	(i)	The company should have told the students about the experiment before carrying it out	B1	3	Condone just telling the school staff. Accept any reference to health issues Award full credit if mention is made of double blind	E
				[1]			

5	(c)	(ii)	Students may have been attracted by the new bars initially but gradually got bored with them. Students found the gold and silver wrapping very attractive	B1 B1 [2]	3 3	Accept other rational reasons such as: Is a single day enough for peoples taste for sweetness to settle down? Students are likely to spend their money in the earlier part of the week Students might prefer a variety of snacks over the week Do not accept duplicates of the given reason (that people prefer less sweet bars).	A A
5	(c)	(iii)	Any reason based on any one of these • Students may only try the bars out as a novelty but lose interest over the week. • Changing the colour of the wrapping may be the real changer. • Only one school – others may have different preferences. • Sample too small. • Only one week – people might change their views over time • No feedback provided • No control group	B1 [1]	3		E

Question			Answer	Marks	AO	Guidance	Grade
6	(a)	(i)	$\frac{\pi}{4} \times 7.2^2 (=40.715 \dots)$	B1	1	Soi or $\pi \times 3.6^2 (=40.715 \dots)$	E
			$= 41 \text{ (micron}^2\text{)}$	B1	1	1 for <i>their</i> 40.715 ... (from calculation seen) to the nearest whole number.	E
				[2]		41 seen implies 2 marks isw if 41 doubled to 82	
6	(a)	(ii)	$\pi \times 7.2 \times 2.25 (=50.89 \dots)$	B1	2		C
			$= 51 \text{ (micron}^2\text{)}$	B1	1	1 for <i>their</i> 50.89 ... (from calculation seen) to the nearest whole number.	E
				[2]		51 seen implies 2 marks	
6	(a)	(iii)	Surface area of model $(2 \times 41) + 51 = 133 \text{ (micron}^2\text{)}$	B1FT	2	<i>Their</i> 41 and 51 MUST be from their responses from 6(a)(i) and 6(a)(ii) and calculated correctly	E
			The model is $(136 - 133)$ $= 3 \text{ (micron}^2\text{)}$ less than the actual So is a fairly close estimate OR Close to the surface area of the red blood cell	B1	3	1 for $(136 - \text{their } 133)$ (must have evidence of calculation) with the appropriate comment	E
				[2]		Condone alternatives e.g. comparing 136 and 133 or arguing appropriately that 133 is not sufficiently close to 136 – need to specify a numerical value or describe the comparison (eg smaller/larger/close)	
6	(a)	(iv)	$(2P + 3Q) + (2P + Q)$ $= 4P + 4Q$	B1	2	Must be simplified	C
			$2(2P + 2Q)$ $= 4P + 4Q$	B1	2	Must be simplified	C
				[2]		If the item fail to gain credit then SC1 for $(2P + 3Q) + (2P + Q)$ and $2(2P + 2Q)$ (need both)	

Question			Answer	Marks	AO	Guidance	Grade
6	(a)	(v)	Arrangement 1 has the greater surface area (S) or	B1	3	1 for any of these or broadly equivalent:- ● Arrangements 3 and 4 have the same surface area ● All have the same number of Qs, 4 ● P effects the surface area of the arrangements ● More separation is better ● 1's surface area is greater than 4 ● 1's surface area is greater than 3	A
				[1]			

Question			Answer	Marks	AO	Guidance	Grade
6	(b)		Patients with group B blood can donate to blood groups B and AB. Total number with Group B = 471 + 463 = 934 Total number with Group AB = 212 + 252 = 464	B1	2	1 for either correct sub-total (934 or 464) or four correct values from way table (471, 463, 212 and 252)	A
			Probability of match with B or AB	B1	2	ISW for incorrect simplification of a correct fraction 1 for correct numerator (1398 or 466)	A
			$= \frac{1398}{9381} \text{ or } \frac{466}{3127}$	B1	2	1 for correct denominator (9381 or 3127) B2 0.149 ... or 0.15 or 15% or 14.9 ...%	A
				[3]			
				[72]			

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