OCR
Oxford Cambridge and RSA

GCE

Mathematics B MEI

H630/01: Pure Mathematics and Mechanics

AS Level

Mark Scheme for June 2023

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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 posted on the RM Cambridge Assessment Support Portal http://www.rm.com/support/ca

3. Log-in to RM Assessor and mark the **required number** of practice responses ("scripts") and the **number of required** standardisation responses.

   YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

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 or the RM Assessor messaging system, or by email.

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 a tick to confirm that the work has been seen.

7. Award No Response (NR) if:
    - there is nothing written in the answer space

Award Zero '0' if:

- anything is written in the answer space and is not worthy of credit (this includes text and symbols).

Team Leaders must confirm the correct use of the NR button with their markers before live marking commences and should check this when reviewing scripts.

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.**
If you have any questions or comments for your team leader, use the phone, the RM Assessor messaging system, or e-mail.

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:
    a. **To determine the level** – start at the highest level and work down until you reach the level that matches the answer
    b. **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
E	Explanation mark 1
SC	Special case
^	Omission sign
MR	Misread
BP	Blank Page
Seen	
Highlighting	

Other abbreviations in mark scheme	Meaning
E1	Mark for explaining a result or establishing a given result
dep*	Mark dependent on a previous mark, indicated by *. The * may be omitted if only one previous M mark
cao	Correct answer only
oe	Or equivalent
rot	Rounded or truncated
soi	Seen or implied
www	Without wrong working
AG	Answer given
awrt	Anything which rounds to
BC	By Calculator
DR	This question included the instruction: In this question you must show detailed reasoning.
BP	Blank Page
Seen	
Highlighting	

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. Unless units are specifically requested, there is no penalty for wrong or missing units as long as the answer is numerically correct and expressed either in SI or in the units of the question. (e.g. lengths will be assumed to be in metres unless in a particular question all the lengths are in km, when this would be assumed to be the unspecified unit.)
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 2 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 A the rubric specifies 3 s.f. as standard, so this statement reads "3 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. E marks are lost unless, by chance, the given results are established by equivalent working. 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.

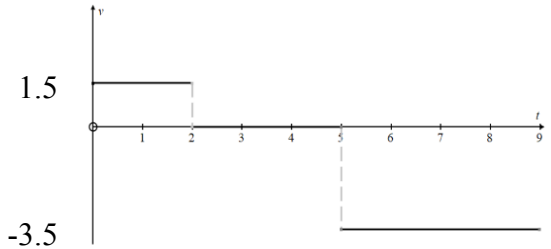
j. If in any case the scheme operates with considerable unfairness consult your Team Leader.

Question			Answer	Marks	AO	Guidance
1			$a = \frac{\mathrm{d}v}{\mathrm{d}t} = 2 + 1.2t \ \mathrm{m\,s^{-2}}$	M1 A1	1.1a 1.1b	Attempt to differentiate. Note $2 + 0.6t$ is obtained by division so award M0A0 if seen. cao
				[2]		

Question			Answer	Marks	AO	Guidance
2	(a)		Substitute $x = 40$, $h = 17 + 15\cos 240 = 9.5\,\mathrm{m}$	B1	1.1b	cao
				[1]		
2	(b)		Maximum when $6x = 0$ or 360 so $x = 0, 60$	M1	2.1	Attempt to use the period of the $\cos 6x$ function. Must include a reference to either 60 or 240 or a sketch illustrating the x-direction stretch. Allow if wrong conclusion reached. Do not allow for an argument based on mechanics principles alone
			but the model is only valid for $0 \leq x \leq 40$ So Tom's argument is invalid.	E1	2.3	clear argument
				[2]		

Question			Answer	Marks	AO	Guidance
3	(a)		position vector of C is $\begin{pmatrix}2\\-1\end{pmatrix}+\begin{pmatrix}-2\\2\end{pmatrix}=\begin{pmatrix}0\\1\end{pmatrix}$	B1 [1]	2.5	Correct column vector notation. ISW if the modulus of the vector is given as well
3	(b)		$\overrightarrow{AB}=\begin{pmatrix}5-2\\4-(-1)\end{pmatrix}, \overrightarrow{BC}=\begin{pmatrix}0-5\\1-4\end{pmatrix},$	M1	2.1	attempt to calculate one of vectors $\overrightarrow{AB}$, $\overrightarrow{BA}$, $\overrightarrow{CB}$ or $\overrightarrow{BC}$ soi
			AB = $\sqrt{3^2+5^2}$ $[=\sqrt{34}]$ BC =$\sqrt{5^2+3^2}$ $[=\sqrt{34}]$	M1	2.1	Attempts to find both lengths. Also allow for argument without distances based on matching components
			distances equal, so B is equidistant from A and C	E1	2.2a	Complete argument www
				[3]		

Question			Answer	Marks	AO	Guidance
4			**DR** $6\left(1-\sin^2 x\right)+\sin x=5$	**M1**	**3.1a**	Uses the identity $\sin^2 x+\cos^2 x=1$
			$6\sin^2 x-\sin x-1=0$	**M1**	**1.1a**	Collects terms and attempts to solve their quadratic
			$\sin x=\frac{1}{2},-\frac{1}{3}$	**A1**	**1.1b**	soi. May be BC. FT their quadratic
			When $\sin x=\frac{1}{2}$, $x=30°,150°$	**A1**	**1.1b**	At least one correct root in the interval for either value of $\sin x$ FT their valid value for $\sin x$
			When $\sin x=-\frac{1}{3}$, $x=-19.5°,-160.5°$	**A1**	**1.1b**	All roots seen from complete working – no extras in the range FT their other valid value for $\sin x$ Ignore additional answers outside the range.
				[5]		

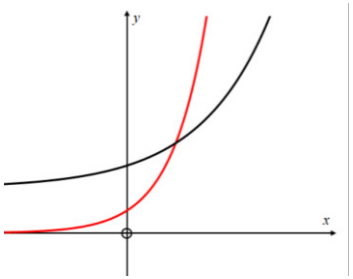
Question			Answer	Marks	AO	Guidance
5	(a)		gradient from (0, 4) to (2, 7) is 1.5 So $s = 1.5t + 4$	M1 A1	3.3 3.3	attempt to find the gradient – award if $\frac{3}{2}$ seen must be s in terms of t
				[2]		
5	(b)			B1* B1 (dep)	3.4 3.4	Three horizontal lines, above, on and below the t-axis. Also allow if the third line segment is above the first line segment because speed is given instead of velocity. their 1.5 and –3.5 seen and $t = 2$ and $t = 5$ clear
				[2]		
5	(c)		The changes in velocity are instantaneous. In reality, the velocity changes over a period of time	E1	3.5b	Accept "suddenly stops" or similar Also accept that the velocity at $t = 2$ or $t = 5$ is ambiguous
				[1]		

Question			Answer	Marks	AO	Guidance
6			$a = 3$	**B1**	**1.1b**	
			Attempt to divide the cubic by $(x + 2)$	**M1**	**1.1a**	Allow grid method or long division as far as the linear term of the quotient
			$b = -5$	**A1**	**1.1b**	May be embedded in final expression
			$c = 4$	**A1**	**1.1b**	May be embedded in final expression FT their b
			$d = -13$	**B1**	**1.1b**	May also be found using the remainder theorem. May be embedded in final expression
			[So $f(x) = (x + 2)(3x^2 - 5x + 4) - 13$]			Need not be given explicitly if all coefficients seen
			By inspection			
			$f(x) = (x + 2)(3x^2 - 5x + 4) - 13$	**B1**		B1 for a embedded in their expression even if incomplete
				M1		Method may be implied by correct b, or correct FT for c
				A1		$b = -5$
				A1		$c = 4$ FT their b with $c = -6 - 2b$
				B1		May also be found using the remainder theorem. May be embedded in their expression
				[5]		

			Alternative method $a = 3$	**B1**		
			expanding and equating coefficients quadratic term $2a + b = 1$ linear term $2b + c = -6$ constant term $2c + d = -5$	**M1**		expanding and equating coefficients for at least the quadratic or linear term
			$b = -5$	**A1**		May be embedded in final expression
			$c = 4$	**A1**		May be embedded in final expression FT their b
			$d = -13$	**B1**		May also be found using the remainder theorem. May be embedded in final expression
			So $f(x) = (x+2)(3x^2 - 5x + 4) - 13$			Need not be given explicitly if all coefficients seen
				[5]		

Question			Answer	Marks	AO	Guidance
7			**DR** Points of intersection with x-axis when $-3x^2 + 7x - 2 = 0$			
				M1	**3.1a**	Attempt to find intersection with x-axis
			$x = \frac{1}{3},\ 2$	**A1**	**1.1b**	Both exact roots seen
			$\text{Area} = \int_{\frac{1}{3}}^{2} \left(-3x^2 + 7x - 2\right) \mathrm{d}x$			
				M1*	**1.1a**	Allow for indefinite integral also
			$= \left[-x^3 + \frac{7}{2}x^2 - 2x\right]_{\frac{1}{3}}^{2}$	**A1**	**1.1b**	Correct indefinite integral
			$\left(-8 + \frac{7\times4}{2} - 2\times2\right) - \left(-\left(\frac{1}{3}\right)^3 + \frac{7}{2\times9} - \frac{2}{3}\right)$	**M1 (dep)**	**1.1b**	Substitution of their limits into their cubic expression must be seen
			$= \frac{125}{54}$	**A1**	**1.1b**	must be exact. Allow mixed number $2\frac{17}{54}$ or recurring decimal $2.3\dot{1}\dot{4}\dot{8}$ www
				[6]		

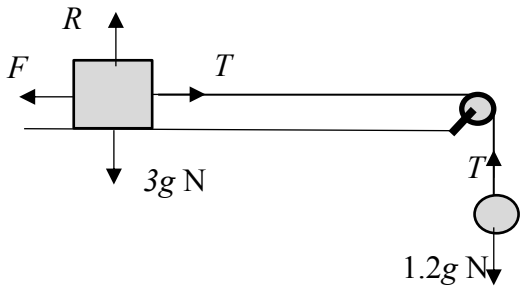
Question			Answer	Marks	AO	Guidance
8	(a)		**DR** $(x-1)^2-1+(y+2)^2-4=20$	**M1** **A1**	**3.1a** **1.1b**	Attempt to complete the square for at least one variable Fully correct. Need not be simplified
			Centre (1, –2)	**A1**	**1.1b**	FT their completed square form
			Radius 5	**A1**	**1.1b**	cao
				[4]		
8	(b)		**DR** Rewrite equation of the line $x=10-3y$	**B1**	**3.1a**	soi
			Substitute $(10-3y-1)^2+(y+2)^2=25$	**M1**	**1.1a**	Attempt to form quadratic in y only Allow either form of the equation used
			$10y^2-50y+60=0$	**M1**	**1.1a**	Attempt to simplify the quadratic to 3 terms
			$y=2,\ 3$	**A1**	**1.1b**	Both roots seen
			So points of intersection at (4, 2) and (1,3)	**A1**	**1.1b**	FT their y-values. No extra points ISW (2, 4) and (3,1) if $x=4$ and $x=1$ seen matched to their y
			Alternative method Rewrite equation of the line $y=\frac{10-x}{3}$	**B1**		soi
			Substitute into equation of the circle $x^2+\left(\frac{10-x}{3}\right)^2-2x+4\left(\frac{10-x}{3}\right)-20=0$	**M1**		Attempt to form quadratic in x only Allow either form of the equation used
			$\frac{10}{9}x^2-\frac{50}{9}x+\frac{40}{9}=0$	**M1**		Attempt to simplify the quadratic to 3 terms
			$x=1,\ 4$	**A1**		Both roots seen
			So points of intersection at (1,3) and (4, 2)	**A1**		FT their x-values No extra points Do not allow for (2, 4) and (3,1)
				[5]		

Question			Answer	Marks	AO	Guidance
9	(a)		Stretch in the x-direction Stretch scale factor ½	B1 B1	1.2 1.1b	
				[2]		
9	(b)			B1 B1	1.1b 1.1b	General shape of exponential graph less steep than the given graph for positive x (note red graph is printed) Horizontal asymptote above the x-axis and intersection with y-axis must be above that for the given graph
				[2]		
9	(c)		The graphs intersect when $e^{2x} = k + e^x$ So when $e^{2x} - e^x - k = 0$ discriminant $(-1)^2 - 4(-k)$ is negative for $k < -\frac{1}{4}$ so no real roots and no points of intersection	M1 M1 E1	2.1 2.1 2.1	Attempts to solve simultaneously. Allow $k = -\frac{1}{4}$ substituted Uses discriminant of the equation must state no real roots or no points of intersection
				[3]		
9	(d)		When $k = 2$, $e^{2x} - e^x - 2 = 0$ gives $e^x = -1, 2$ So $x = \ln 2$ as $e^x = -1$ is not possible	M1 A1	2.1 2.1	Evaluates e^x from their quadratic and attempts to use natural logs must state that ln2 is a root and that there are no others. Allow SC1 for substituting $x = \ln 2$ in both equations and concluding it must be a root

Question			Answer	Marks	AO	Guidance
				[2]		

Question			Answer	Marks	AO	Guidance
10	**(a)**	**(i)**	When $t = 0, L = 2800$ She invests £2800	**B1**	**3.1b**	cao
				[1]		
10	**(a)**	**(ii)**	Each year the amount is multiplied by 1.023 which is 2.3% annual interest	**B1**	**3.1b**	cao
				[1]		
10	**(b)**		$A = 3000 \times 1.02^t$ So $a = 3000$ And $b = 1.02$	**B1** **B1**	**1.1b** **1.1b**	Allow for a and b given explicitly or embedded in an exponential expression
				[2]		

10	**(c)**		Equal amounts if $3000\times1.02^t = 2800\times1.023^t$ $\ln 3000 + t\log 1.02 = \ln 2800 + t\ln 1.023$ $t = \dfrac{\ln 3000 - \ln 2800}{\ln 1.023 - \ln 1.02} = 23.5$	**M1** **M1**	**3.1b** **1.1a**	Use of laws of logarithms leading to a linear equation in t using their values of a and b Collecting terms
			So they have equal amounts after 23.5 years	**A1**	**1.1b**	Cao must be 1 d.p.
			Alternative method Equal amounts if $3000\times1.02^t = 2800\times1.023^t$ $\dfrac{3}{2.8} = \left(\dfrac{1.023}{1.02}\right)^t$ so $t = \dfrac{\log\frac{3}{2.8}}{\log\frac{1.023}{1.02}} = 23.5$	**M1** **M1**		Equating and attempt to collect terms using their values of a and b leading to an equation in which t appears only once Uses logarithms leading to a value for t allow $\log_{1.003}1.07$ or $\frac{\log 1.07}{\log 1.003}$ or better for the method mark
			So they have equal amounts after 23.5 years	**A1**		Cao must be 1 d.p. Note this is obtained from exact values or using 1.00294 and 1.0714 or better Allow full credit for trial and improvement that gives 23.5 and £4778 to the nearest pound
						If M0M0 given, allow SC2 for 23.5 seen, without £4778 If M0M0 given, allow SC1 for at least 2 trials clearly seen even if a root not found
				[3]		

Question			Answer	Marks	AO	Guidance
11	(a)			B1 B1	3.3 3.3	Both forces on the sphere correct and labelled All forces correct on the block. Tension must be marked the same or if T_1 and T_2 used, equated to each other elsewhere in the question. The horizontal force F must be in the correct direction
				[2]		
11	(b)		For the system to be in equilibrium sphere gives $T = 1.2g$ N for the block $F = T = 1.2g = 11.76$	M1 A1	1.1b 1.1b	soi any form
				[2]		
11	(c)		$1.2g - T = 1.2a$	B1	3.4	cao
				[1]		
11	(d)		For the block $T = 3a$ Add the equations $1.2g = 4.2a$ $a = 2.8$ ms^{-2} Substitute $T = 3a = 8.4$	M1 A1	1.1a 1.1b	Attempt to solve simultaneous equations leading to a value for a. Do not award if their equation 11(c) does not have T. Cao. Allow $\frac{6}{7}g$
				[2]		

Question			Answer	Marks	AO	Guidance
12			For AB, Newton's second law $8=5a$			
			acceleration is 1.6 ms^{-2}	**B1**	**3.1b**	Uses Newton's second law to calculate acceleration
			for AB $u=0,\ a=1.6,\ t=3$			
			$s=\frac{1}{2}at^2=\frac{1}{2}\times 1.6\times 3^2=7.2$ m	**M1**	**1.1a**	Uses *suvat* equation(s) and their a leading to a value for s
			velocity at B $v=at=1.6\times 3=4.8$ ms^{-1}	**M1**	**3.1b**	Uses *suvat* equation(s) and their a leading to a value for velocity at B
			for BC Newton's second law $8-28=5a$	**M1**	**3.1b**	Uses Newton's second law to calculate acceleration. Condone missing 8N force. Allow sign errors.
			acceleration is -4 ms^{-2}	**A1**	**1.1b**	soi
			for BC $u=4.8,\ v=0,\ a=-4$			
			$0^2=4.8^2-2\times 4s$	**M1**	**1.1a**	Uses *suvat* equation(s) and their a leading to a value for s.
			$s=2.88$ m	**A1**	**1.1b**	FT their negative a and their positive velocity at B
			distance AC is $7.2+2.88=10.08$ m	**A1**	**1.1b**	Allow 10 m
				[8]		

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