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Mark Scheme (Results)

October 2025

International Advanced Level In Mechanics M1
WME01/01

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

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EDEXCEL IAL MATHEMATICS
General Instructions for Marking

1. The total number of marks for the paper is 75.

2. The Edexcel Mathematics mark schemes use the following types of marks:
   - **M** marks: Method marks are awarded for 'knowing a method and attempting to apply it', unless otherwise indicated.
   - **A** marks: Accuracy marks can only be awarded if the relevant method (M) marks have been earned.
   - **B** marks are unconditional accuracy marks (independent of M marks)
   - Marks should not be subdivided.

3. Abbreviations

These are some of the traditional marking abbreviations that will appear in the mark schemes and can be used if you are using the annotation facility on ePEN.

- bod – benefit of doubt
- ft – follow through
- the $\surd$ symbol will be used for correct ft
- cao – correct answer only
- cso - correct solution only. There must be no errors in this part of the question to obtain this mark
- isw – ignore subsequent working
- awrt – answers which round to
- SC: special case
- oe – or equivalent (and appropriate)
- d… or dep – dependent
- indep – independent
- dp decimal places
- sf significant figures
- $*$ The answer is printed on the paper or ag- answer given
- $\lfloor$ or d… The second mark is dependent on gaining the first mark

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4. All A marks are 'correct answer only' (cao.), unless shown, for example, as A1 ft to indicate that previous wrong working is to be followed through. After a misread however, the subsequent A marks affected are treated as A ft, but manifestly absurd answers should never be awarded A marks.

5. For misreading which does not alter the character of a question or materially simplify it, deduct two from any A or B marks gained, in that part of the question affected. If you are using the annotation facility on ePEN, indicate this action by 'MR' in the body of the script.

6. If a candidate makes more than one attempt at any question:
    - If all but one attempt is crossed out, mark the attempt which is NOT crossed out.
    - If either all attempts are crossed out or none are crossed out, mark all the attempts and score the highest single attempt.

7. Ignore wrong working or incorrect statements following a correct answer.

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General Principles for Mechanics Marking

(NB specific mark schemes may sometimes override these general principles)

- Rules for M marks:
  - correct number of terms
  - dimensionally correct
  - all terms that need resolving (i.e. *multiplied* by cos or sin) are resolved
  - only terms that need resolving are resolved
  - +/– errors are condoned
  - sin/cos confusion is condoned
- Omission or extra g in a resolution is an accuracy error not method error.
- Omission of mass from a resolution is a method error.
- Omission of a length from a moments equation is a method error.
- Omission of units or incorrect units is not (usually) counted as an accuracy error.
- DM indicates a dependent method mark, i.e. one that can only be awarded if a previous specified method mark(s) has been awarded.
- Any numerical answer which comes from use of $g = 9.8$ should be given as a decimal to 2 or 3 SF.
- Use of $g = 9.81$ should be penalised once per (complete) question.
  - N.B. Over-accuracy or under-accuracy of correct answers should only be penalised *once* per complete question. However, premature approximation should be penalised every time it occurs.
- Marks must be entered in the same order as they appear on the mark scheme.
- In all cases, if the candidate clearly labels their working under a particular part of a question i.e. (a) or (b) or (c)…then that working can only score marks for that part of the question.
- Accept column vectors in all cases.
- Misreads – if a misread does not alter the character of a question or materially simplify it, deduct two from any A or B marks gained, bearing in mind that after a misread, the subsequent A marks affected are treated as A ft

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Mechanics Abbreviations

M(A)	Taking moments about A
N2L	Newton's Second Law (Equation of Motion)
NEL	Newton's Experimental Law (Newton's Law of Impact)
HL	Hooke's Law
SHM	Simple harmonic motion
PCLM	Principle of conservation of linear momentum
RHS	Right hand side
LHS	Left hand side

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Question Number	Scheme	Marks	Notes
1a	M(C)	M1	Or equivalent to form an equation in *x* only.
			$\text{vert}: 240 = T_C + 90$ $\text{M}(A): 2T_C + 90(8-x) = 240\times 4$ $\text{M}(D): (6-x)T_C = 240(4-x)$ $\text{M}(B): 6T_C + 90x = 240\times 4$ $\text{M}(G): 2T_C = 90(4-x)$ with T_C eliminated to give an equation in *x* only.
	$240\times 2 = (6-x)\times 90$	A1	Correct unsimplified equation in *x* only.
	$x = \frac{2}{3}$ *	A1*	Obtain given answer from correct working, with at least one line of intermediate working, e.g. after $240\times 2 = (6-x)\times 90$, if they use M(C). N.B. Need '*x* ='
		[3]	
1b	M(*D*)	M1	Or equivalent to form an equation in *W* only. M0 if 183 is never used, including use of 182. M0 if 90 or 150 is used. N.B. Use of *Wg* is an A error.
			$\text{vert}: 240 + W = 183 + T_D$ $\text{M}(A): 2\times 183 + T_D \times \frac{22}{3} = 240\times 4$ $\text{M}(C): 2W + T_D \times \frac{16}{3} = 240\times 2$ $\text{M}(B): 6\times 183 + T_D \times \frac{2}{3} = 240\times 4 + 8W$ $\text{M}(G): 2\times 183 = T_D \times \frac{10}{3} + 4W$ with T_D (=81) eliminated to give an equation in *W* only.
	$240\times \frac{10}{3} + W\times \frac{22}{3} = 183\times \frac{16}{3}$	A1 A1	Unsimplified equation in *W* only with at most one error

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			Correct unsimplified equation in *W* only
	(*W* =) 24	A1	Cao N.B. Allow decimals (3.33, 7.33 etc) in working.
			N.B. Allow use of $T_C < 183$ OR $T_C \leq 183$ for first 3 marks but must have equality for the final A1.
		[4]	
		(7)	

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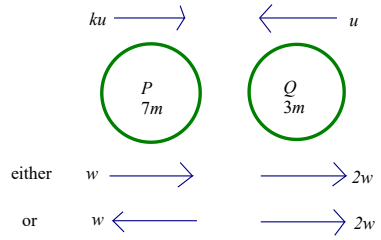
Question Number	Scheme	Marks	Notes
2a			
			N.B. Must be using correct pairings of masses and velocities for all M marks in this question.
	Use of $I = mv - mu$ for Q	M1	Dimensionally correct and subtraction seen or implied. (They are subtracting a negative, so they could go direct to "+") M0 for impulse-momentum for *P* or use of *m* for mass if not subsequently replaced. Condone sign errors. .
	$\frac{7}{2}mu = 3m\left(2w - \left(-u\right)\right)$	A1	Correct unsimplified equation in *u* and *w*
	$w = \frac{1}{12}u$	A1	0.083*u* or better N.B. Must be a single decimal or fraction
		[3]	
2b	Use of $I = mv - mu$ for *P* or equivalent	M1	Use impulse-momentum for *P* or CLM for one valid option with their *w* substituted, which must be a multiple of *u* but could also contain *k*'s if they've used CLM in (a). Allow an extra *g* throughout the CLM equation or *m* cancelled consistently. Condone sign errors.

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			M0 for impulse-momentum for Q or use of *m* for mass if not subsequently replaced.
	EITHER: (see diagram) $-\frac{7mu}{2} = 7m\left(\frac{u}{12} - ku\right)$ or $7mku - 3mu = \frac{7mu}{12} + \frac{6mu}{12}$ OR: (see diagram) $\frac{7mu}{2} = 7m\left(\frac{u}{12} - (-ku)\right)$ or $7mku - 3mu = \frac{-7mu}{12} + \frac{6mu}{12}$	A1ft	Correct unsimplified equation for *k* but allow uncancelled *m*'s. Follow their *w*
	EITHER: $k = \frac{7}{12}$	A1	0.58 or better (0.58333..) N.B. $k = \frac{7}{12}$ must be entered on ePEN for this A mark.
	Use of $I = mv - mu$ for *P* or equivalent	M1	Use impulse-momentum or CLM correctly for second valid option with their *w* substituted.- i.e. the velocity of *P* should have the opposite sign to that used in their first equation. Allow an extra *g* throughout the CLM. equation or *m* cancelled consistently. .
	OR: $k = \frac{5}{12}$	A1	0.42 or better (0.41666..) N.B. $k = \frac{5}{12}$ must be entered on ePEN for this A mark.
		[5]	
		(8)	

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	Allow column vectors or i j form for vectors throughout.		
Question Number	**Scheme**	**Marks**	**Notes**
3a	Resultant force $=\left(-2\mathbf{i}+3\mathbf{j}+4\mathbf{i}+2\mathbf{j}\right)=\left(2\mathbf{i}+5\mathbf{j}\right)\left(\mathrm{N}\right)$	B1	Seen or implied
	Correct use of $\mathbf{F}=m\mathbf{a}$	M1	Must have added the forces
	Acceleration $=\left(\mathbf{i}+2.5\mathbf{j}\right)\left(\mathrm{m\,s^{-2}}\right)$	A1	Isw if they find the magnitude
		[3]	
3b	$\mathbf{v}=\left(3\mathbf{i}-4\mathbf{j}\right)+3\mathbf{a}$	M1	Use of $\mathbf{v}=\mathbf{u}+\mathbf{a}t$
	$\mathbf{v}=\left(3\mathbf{i}-4\mathbf{j}\right)+3\left(\mathbf{i}+2.5\mathbf{j}\right)$	A1ft	Correct unsimplified Follow their a
	Use of Pythagoras	DM1	Correct method to obtain the speed, dependent on M1
	$\left\|\mathbf{v}\right\|=\sqrt{6^2+3.5^2}=6.95\left(\mathrm{m\,s^{-1}}\right)$	A1	6.9 or better (6.94622……) Allow $\sqrt{\frac{193}{4}}$ oe
		[4]	
3c	Resultant force $=\left(\left(2+b\right)\mathbf{i}+\left(5+c\right)\mathbf{j}\right)\left(\mathrm{N}\right)$	B1	i's and j's must be collected but can be unsimplified, seen or implied.
	Correct use of direction to form equation in *b* and c only e.g $2+b=5+c$ or $2+b=\lambda$ and $5+c=\lambda$ with λ eliminated	M1	M0 if they use a specific numerical value for λ or they use $2+b=-(5+c)$
	$b-c=3$ *	A1*	Obtain given answer from correct working
		[3]	
3d	Use magnitude of resultant to form an equation in *b* and c	M1	Allow square roots
	$200=\left(2+b\right)^2+\left(5+c\right)^2$	A1ft	Correct unsimplified equation with no square roots. Follow their resultant.
	Form an equation in *b* or c only	DM1	e.g. $200=2\left(5+c\right)^2$ or $200=2\left(2+b\right)^2$

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			dependent on M1
	ALT 1: Use magnitude of resultant to form equation in λ	M1	
	$200 = \lambda^2 + \lambda^2$	A1	
	Use either $\lambda = 10$ or $\lambda = -10$ to find equations in *b* and c $2 + b = 10$ and $5 + c = 10$ Or $2 + b = -10$ and $5 + c = -10$	DM1	Dependent on M1
	$\mathbf{F}_3 = (8\mathbf{i} + 5\mathbf{j})\text{N}$ $\mathbf{F}_3 = (-12\mathbf{i} - 15\mathbf{j})\text{N}$	A1	Both forces, condone missing N's.
		[4]	
			N.B. If they go for $2 + b = 10$ and $5 + c = 10$ to obtain $(8\mathbf{i} + 5\mathbf{j})\text{N}$ only, allow M1A1M1A0 for obtaining one force.
		(14)	

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Question Number	Scheme	Marks	Notes
4a	Correct use of *suvat* to give an equation in *h* only.	M1	Complete method – e.g. they may find the time (25/49) first
	e.g. $0 = 5^2 - 2gh$ or $5^2 = 0 - 2gh$	A1	Correct unsimplified equation in *h* only
	1.3 or 1.28 (m)	A1	2 or 3 sf No isw if they add 10.
		[3]	
4b	Use *suvat* to form an expression for the distance travelled by either particle in terms of *T* or *t*. e.g. $\pm(5T - \frac{1}{2}gT^2)$ Case 1 (*P*) $\pm\left[7(T-1) - \frac{1}{2}g(T-1)^2\right]$ Case 1 (*Q*) OR $\pm\left[5(t+1) - \frac{1}{2}g(t+1)^2\right]$ Case 2 (*P*) $\pm(7t - \frac{1}{2}gt^2)$ Case 2 (Q)	M1	For Case 1, allow consistent use of *t* for *T* For Case 2, penalise incorrect use of *T*
	Use *suvat* to form a correct expression, in terms of the same variable, for the distance travelled by the other particle	M1	N.B. M0M1 on ePEN is not possible.
	$10 + 5T - \frac{1}{2}gT^2 = 7(T-1) - \frac{1}{2}g(T-1)^2$ Or $10 + 5(t+1) - \frac{1}{2}g(t+1)^2 = 7t - \frac{1}{2}gt^2$	A1	Correct unsimplified equation in *T* or their *t*
	$(T =)$ 1.9 or 1.86	A1	2 or 3 sf
		[4]	
	ALT 1 Find position and velocity of *P* at *t* = 1: 10.1 m above ground, moving downwards at 4.8 m s^{-1} then: $\pm(4.8t + \frac{1}{2}gt^2)$ (*P*) M1 $\pm(7t - \frac{1}{2}gt^2)$ (Q) M1		

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	$(4.8t+\frac{1}{2}gt^2)+(7t-\frac{1}{2}gt^2)=10.1$ **A1** $(T=)$ 1.9 or 1.86 **A1**		
	ALT 2 **Find position and velocity of Q at *t* = 0:** **11.9 m 'below' ground, moving upwards at 16.8** m s^{-1} **then:** $\pm(5T-\frac{1}{2}gT^2)$ **(*P*)** **M1** $\pm(16.8T-\frac{1}{2}gT^2)$ **(Q)** **M1** $16.8T-\frac{1}{2}gT^2-(5t-\frac{1}{2}gT^2)=21.9$ **A1**		
	$(T=)$ 1.9 or 1.86	**A1**	**2 or 3 sf**
4c	**e.g.** $v=-5+gT$ **or** $v=5-gT$	**M1**	**Complete method using *suvat* and their *T*** **M0 for** $v=5+gT$
	Speed of *P* = 13 or 13.2 $\left(\text{ms}^{-1}\right)$	**A1**	**2 or 3 sf** **Must be positive.**
		[2]	
		(9)	

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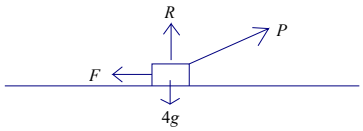
Question Number	Scheme	Marks	Notes
5a			
	Resolve horizontally	M1	Need relevant terms. Condone sin/cos confusion and sign errors
	$P\cos 30° = F$	A1	Correct unsimplified equation
	Resolve vertically	M1	Need relevant terms. Condone sin/cos confusion and sign errors
	$P\sin 30° + R = 4g$	A1	Correct unsimplified equation
	$P\frac{\sqrt{3}}{2} = \frac{2}{3}R$ $\Rightarrow P\left(\frac{1}{2} + \frac{3\sqrt{3}}{4}\right) = 4g$	DM1	Use $F = \frac{2}{3}R$ to obtain an equation in *P* only, dependent on previous M marks
	$(P =)$ 22 or 21.8	A1	2 or 3 sf
		[6]	
5b	N.B. If they increase their value of *P* by 25, treat as an MR i.e. they can score all three M marks in (b) and M1A1ft in (c) if they get *v* = 4.7 or 4.74.		
	$25\sin 30° + R = 4g$ (*R* = 26.7)	M1	Need relevant terms. Condone sin/cos confusion and sign errors M0 if not using 25 and/or uses their *R* from (a) N.B. M1 for *R* = 26.7
	Equation of motion	M1	Need relevant terms. Condone sin/cos confusion and sign errors M0 if not using 25 and/or uses 2/3*R* for *F*, where *R* is their *R* from (a).

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	$25\cos 30° - F = 4a$	A1	Correct unsimplified equation
	$25\cos 30° - \frac{2}{3}(4g - 25\sin 30°) = 4a$	DM1	Use $F = \frac{2}{3}R$ to obtain an equation in *a* only, dependent on both previous M marks
	0.96 or $0.963\left(\text{m s}^{-2}\right)$	A1	2 or 3 sf
		[5]	
5c	e.g. $v^2 = 2\times a\times 1.5$	M1	Complete method to find an equation in *v* only using their *a* which must be POSITIVE and not *g*
	1.7 or 1.70 $\left(\text{m s}^{-1}\right)$	A1 cso	2 or 3 sf Beware of a 'correct' answer from an incorrect value of *a*.
		[2]	
		(13)	

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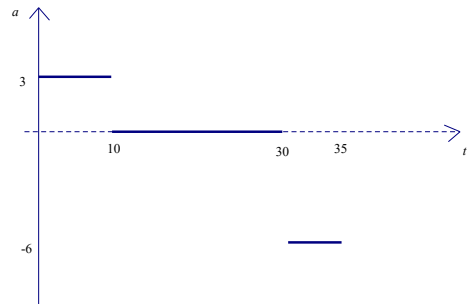
Question Number	Scheme	Marks	Notes
6a i	Acceleration = $3\left(\text{ms}^{-2}\right)$	B1	
ii	Decceleration = $6\left(\text{ms}^{-2}\right)$	B1	Must be positive (–) 6 is B0
		[2]	
6b		B1ft B1ft	Give BOD for the middle section. Any 2 horizontal lines correct 3 correct horizontal lines and no other solid lines, and 10, 30, 35, 3, -6 marked. Condone dotted vertical lines N.B. Follow their accelerations for one +ve and one -ve.
		[2]	
6c	Distance travelled $=\frac{(20+35)}{2}\times 30$ Or = $\frac{1}{2}\times 10\times 30+(20\times 30)+\frac{1}{2}\times 5\times 30$ Or $=\frac{1}{2}\times 3\times 10^2+(20\times 30)+\frac{1}{2}\times 6\times 5^2$	M1	Or equivalent method for total distance Unsimplified expression must be correct for this mark
	= 825 (m)	A1	Accept 830
		[2]	
6d	Distance travelled by motorcycle $=\frac{1}{2}\times A\times 15^2\left(=\frac{225A}{2}\right)$ or $\frac{1}{2}\times 15V$ seen	M1	Allow *a* for *A*. Condone 20 for 15
	Using equal distances travelled by both at *t* = 20 to set up an equation in *A* only (i.e. must also use *V* = 15*A* if necessary)	M1	Condone 20 for 15

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	$\frac{225A}{2}=\frac{1}{2}\times10\times30+10\times30$ Or: $\frac{225A}{2}=\frac{(20+10)}{2}\times30$ Or: $\frac{1}{2}\times15V=\frac{(20+10)}{2}\times30$ and (V =) 60 = 15 A	A1	Correct unsimplified equation in *a* or *A* only
	(A =) 4	A1	
		[4]	
		(10)	

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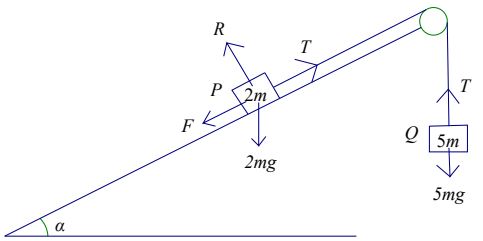
Question Number	Scheme	Marks	Notes
7			
	N.B. If *m*'s missing consistently, can score max (a)M1A0 (b)M1A0M1M1A0DM0A0 (d)M1A1DM0A0. For inconsistent omission of *m*'s, mark as per the scheme.(Omission of an *m* is an M error)		
7a	Equation of motion for Q:	M1	Need correct terms. Condone sign errors.
	$5mg - T = 5ma$	A1	Correct equation
		[2]	
7b	Resolve perpendicular to the plane	M1	Condone sine /cosine confusion N.B. $R = mg\cos\alpha$ is M0
	$R = 2mg\cos\alpha$	A1	Correct unsimplified.
	$F = \frac{1}{8} \times 2mg\cos\alpha$	M1	Use of $F = \frac{1}{8}R$
	Equation of motion for *P*:	M1	Need correct terms. Condone sign errors and sin/cos confusion.
	$T - F - 2mg\sin\alpha = 2ma$	A1	Correct equation. Condone combined equation: $5mg - F - 2mg\sin\alpha = 7ma$
	$\begin{cases} 10mg - 2T = 10ma \\ 5T - 5mg = 10ma \end{cases}$	DM1	Solve for *T*, dependent on first and third M marks. N.B. DM0 if they do not use the 2 equations that have earned marks.
	$T = \frac{15mg}{7}$	A1	Accept 2.1*mg* or better
		[7]	

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7c	The acceleration of both blocks / particles is the same.	B1	Or equivalent. N.B. Accept: 'They have the same acceleration but not 'it (or the string) has the same acceleartion.' B0 if include additional incorrect statement e.g. same tension, string won't break
		[1]	
7d	Resolve to find force on pulley	M1	Complete method to obtain the resultant force, allow sin/cos confusion but must be correct numerical angle or correct in terms of α
	$2T\cos\left(\frac{90^\circ-\alpha}{2}\right)$	A1	Correct unsimplified expression
ALT 1	Use cosine rule to find force on pulley	M1	Complete method to obtain the resultant force. Allow WITHOUT ROOT
	$\sqrt{T^2+T^2-2\times T\times T\cos(90^\circ+\alpha)}$	A1	Correct unsimplified expression WITH ROOT but must be correct angle.
ALT 2	Use horiz and vert components and Pythagoras	M1	Complete method to obtain the resultant force, allow sin/cos confusion, Allow WITHOUT ROOT
	$\sqrt{(T\cos\alpha)^2+(T+T\sin\alpha)^2}$	A1	Correct unsimplified expression WITH ROOT
	N.B. For ALT 1 and 2, allow without root sign, if they equate it to $(kmg)^2$ oe		
	Substitute for *T* and trig. and solve for *T*, must take square root when appropriate, and must be a multiple of *mg*	DM1	Dependent on the previous M1

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	$k = 3.57$ **to 3 sf**	**A1**	**3 sf only** $\left(\frac{90\sqrt{13}}{91}\right)$ **is A0** **3.57*mg* oe is A0**
		[4]	
		(14)	