A-level
Physics
PHY6T/P14
Final Marking Guidelines

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Guidance for teachers marking Physics ISAs

These are the **Stage 1 Marking Guidelines,** which provide guidance on the marking of Stage 1 of the ISA. The full **Marking Guidelines** will be published on eAQA in March 2014.

The marking guidelines have been devised by a team of experienced examiners. They have tried to anticipate all possible responses worthy of credit. In order to establish consistency it is essential that all centres mark exactly to this scheme.

For ease of use the mark scheme has been presented in tabular form. Concise answers are given in the left-hand column. More detailed explanatory notes for some questions are included in the right-hand column.

Marking of Stage 1 of the ISA – student data and graph – should ideally be completed before the ISA written test to ensure that candidates do not change any data. (Alternatively, centres should take other steps to ensure that candidates do not change any information on their data script/graph). The marking of this section should be annotated with a red tick at the point where the mark has been awarded together with the letter referring to this mark scheme, eg '✓b'. **No other comments or feedback should be written on the candidates' scripts**. The total mark for this section should be written at the top of the paper. This will be transferred to the grid on the front page of the ISA test booklet.

Marking of the ISA test should be done using a red tick to represent each mark awarded. Further annotated comments **can** be added where necessary as an explanation as to why a particular point has been awarded which will greatly aid the moderation process. The total mark for each question should be entered on the grid on the front cover of the ISA booklet and the total mark calculated.

Assessment Advisers are allocated to each centre and they can advise on the marking process. You should receive the contact details for the Assessment Advisor through the post. If you have not received them, please contact the AQA subject team.

Stage 1		Mark	Additional guidance notes
(a)	d accurately recorded to within 0.3 cm together with evidence of repeat readings for d✓	**1**	These readings must be clearly identified by a label or comment and be expressed to the nearest mm with the unit given. If the evidence of repeat readings is only shown on the A3 sheet this should be sent to the moderator with the stage 1 papers. If the repeat readings are identical then the uncertainty in d should be quoted as 1mm.
(b)	Uncertainty for d calculated from 0.5 x spread of repeats **and** Uncertainty for l quoted between 2 and 5 mm✓	**1**	The uncertainty in l is greater than 1mm since judgement is needed to measure from the centre of the bob to the position on the string.
(c)	Table with column headings, including appropriate units, showing all values of l and T, as well as repeat timings for all T ✓	**1**	Column headings can be either in words or appropriate symbols. Units can be in words or the correct abbreviation. There must be a suitable separator between the stated quantity and its unit. e.g. l / cm or l(cm) This mark cannot be awarded to candidates who include units in the body of the table.
(d)	Precision of stopclock or stopwatch noted. All elapsed time measurements must be for a period of at least 10T and there must be at least seven sets of timings with a minimum range of 60 cm✓	**1**	All recorded times consistent with the precision of the stopclock / stop watch.

(e)	A graph of T against l, with T on the y-axis. Suitably large graph scale (do not award if scale on either axis could have been doubled). Scale must have 'sensible' divisions which can be easily read e.g. scales in multiples of 3,6,7,9 etc are not acceptable: both axes must be labelled with quantity and unit. ✓	**1**	The plotted points should occupy over half of each axis so neither scale is likely to start at zero. For axes labels, the same convention as for table headings is required. Allow ecf from (c) for incorrect unit but do not award the mark if either unit is missing. A scale division in 4's might sometime be acceptable. Examples of acceptable and unacceptable scales in 4's are given in the teachers support section of the website.
(f)	Points accurately plotted to within 1 mm ✓ *Markers should check the second and fifth plotted points*	**1**	This mark is independent of mark (e). i.e. if candidates have used an unsuitable scale they can still achieve the mark for accurately plotting the points.
(g)	Best fit curve well drawn. ✓	**1**	A smooth, single, continuous, gentle curve is expected with the points evenly scattered about the line of best fit. **No mark for a best fit straight line.** Point to point straight lines are not acceptable.
	Total	**7**	

Section A		Mark	Additional guidance notes
1(a)(i)	$\cos\theta$ correctly calculated and given to 2 or 3sf ✓	**1**	Answer of approximately 0.5
1(a)(ii)	Percentage uncertainty for both *d* and *l* correctly found from candidate's stage 1 answers✓ Candidates percentages added correctly✓ Consistent answer quoted to 1 or 2 sf ✓	**3**	Allow ecf for second and third mark.
1(a)(iii)	$F = \frac{4\pi^2}{T^2} \times 0.100 \times l$ correctly calculated for shortest length pendulum from Stage 1 2 or 3 sf with unit (N)✓	**1**	Answer of approximately 1 N
1 (a)(iv)	The uncertainty in d does not contribute to the uncertainty in F✓ The percentage uncertainty in l is added into the percentage uncertainty in F✓ Twice the percentage uncertainty in T is added into the percentage uncertainty in F✓	**3**	

1 (b)	*T* increases <u>non-linearly</u> with *I*✓ As *I* gets larger the (rate of) increase gets less✓	**2**	
1 (c)	Because the vertical component of the tension is needed to support the weight of the mass *m* ✓	**1**	Alternative: Reference to $F \sin\theta = mg$ where $\theta > 0$
	Total	**11**	

Section B		Mark	Additional guidance notes
2(a)	<table><tr><td>0.327</td><td>1.30</td></tr><tr><td>0.380</td><td>1.56</td></tr></table> ✓	**1**	All four values correct. Exact answers only
2(b)	Points accurately plotted to within ± 1 mm ✓ Accurate best straight line drawn ✓	**2**	Both points must be accurately plotted Assess the line of best fit very carefully To award the mark the line should be a straight line with approximately an equal number of points on either side of the line
2(c)	Triangle drawn with smallest side ≥ 8 cm and correct values read from the best fit line ✓ Gradient in range 3.85 to 4.14 ✓	**2**	Accept 2 or 3 sf only for the answer. No unit penalty
2(d)	$\sqrt{(I^2 - r^2)} = 0.484$, hence $T = \sqrt{(\text{gradient} \times 0.484)}$ ✓ Expect T = 1.39 s value must be consistent with candidates gradient ✓ Final answer must have 3 sf and a unit	**2**	

2(e)(i)	Gradient equated with $4\pi^2/g$ ✓ Expect g = 9.8 ms^{-2} value must be consistent with candidates answer to 2(d) ✓ The final answer must be expressed to 2 or 3 sf with the correct unit	**2**	
2(e)(ii)	There is only a small amount of scatter of points about the line of best fit so the results can be considered reliable ✓	**1**	The candidate's answer must refer to the scatter of points and not the value for g obtained. If (eg because of poor plotting) the candidate states that the results are unreliable do not award the mark.
2(e)(iii)	T would be larger so the percentage uncertainty in the times would be smaller✓ The uncertainty in the value for g would be smaller✓	**2**	
	Total	**12**	

Section B		Mark	Additional guidance notes
3(a)	The angle does not depend on the mass of the chair or the person in it ✓ This is because centripetal acceleration depends only on the angular speed and the radius of the circle ✓	**2**	Accept algebraic explanation: $F\sin\theta = mg$, $F\cos\theta = mv^2/r$ $\therefore$ $\tan\theta = gr/v^2$ ✓ Hence θ does not depend on m ✓
3(b)	Outline description of a reasonable method for measuring the time for one rotation (and hence the angular speed) ✓ Outline description of a reasonable method for measuring the radius or diameter of the circular motion ✓	**2**	
3(c)	(A) Calculate the tension in the chains ✓ (B)when the ride rotates at maximum angular speed ✓ (C) carrying a passenger of the maximum allowed mass ✓ (D) Load the chair with enough mass to exceed the maximum operating tension ✓ (E) by a factor of at least three times the operating tension ✓	**3 max**	***Award up to three from the five marks available*** Place a tick clearly near the appropriate point in the text for each mark awarded, and annotate the tick with the corresponding letter (eg ✓A)
	Total	**7**	

'Section B		Mark	Additional guidance notes
4	(A) I would need a set of masses to increase the weight of the disc and a ruler to measure r ✓ (B) I would increase the load on the disc a step at a time and for each load find and measure the value of r at which the disc just starts to slip when the table is turning ✓ (C) I would use a balance to find m the mass of the disc plus its load ✓ (D) I would calculate F_{max} from the formula given in the question for each m ✓ (E) I would make measurements for at least seven values of m and take repeat readings for each m ✓ (F) I would plot a graph of F_{max} against mg to show how F varies with the weight ✓ (G) Consideration of a suitable method of fixing the loading mass to the disc ✓	**4 max**	**Award up to four from the six marks available** Place a tick clearly near the appropriate point in the text for each mark awarded, and annotate the tick with the corresponding letter (eg ✓A)
	Total	**4**	