MARK SCHEME for the May/June 2010 question paper

for the guidance of teachers

9702 PHYSICS

9702/35 Paper 31 (Advanced Practical Skills), maximum raw mark 40

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

• CIE will not enter into discussions or correspondence in connection with these mark schemes.

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UNIVERSITY of CAMBRIDGE International Examinations

	Page 2		Mark Scheme: Teachers' version	Syllabus	Paper
			GCE AS/A LEVEL – May/June 2010	9702	35
1	(c)	Six sets of readings of <i>I</i> and <i>V</i> scores 5 marks, five sets scores 4 marks, etc. Indicate the number of sets of readings. Incorrect trend then -1 (wrong trend <i>P</i> increases, R^4 decreases).		[5]	
			aratus correctly set up without help from supervisor. r help –2, minor help –1		[2]
		Rang	ge of V: $V_{\min} \le 2$ V and $V_{\max} \ge 10$ V.		[1]
		 Column headings (V/V, I/A, P/W, R/Ω, R⁴/Ω⁴) Must have V and I columns. Each column heading must contain a quantity and a unit where appropriate. Ignore units in the body of the table. There must be some distinguishing mark between the quantity and the unit (solidus is expected but accept, for example, V(V)). Consistency of presentation of <u>raw</u> readings. All raw values of V must be given to the same number of decimal places and this must be 0.1 V. All raw values of I must be given to the same number of decimal places 			[1]
					[1]
		S.F. f	ficant figures. for <i>P</i> must be the same as, or one more than, the least r or <i>I</i> . Check each row.	umber of S.F. used	[1]
			es of R^4 correct. Underline and check the specified value orrect, write in the correct value.	of R^4 .	[1]
	(d)	t S	Graph Axes: Sensible scales must be used, no awkward scales Scales must be chosen so that the plotted points must of the graph grid in both <i>x</i> and <i>y</i> directions. Indicate false of Scales must be labelled with the quantity which is being Allow inverted axes but do not allow wrong graph. Scale markings should be no more than three large squa	ccupy at least half igin with FO. plotted. Ignore units	[1]
		A V F	Plots All observations must be plotted. Write a ringed total of plotted points. Do not accept blobs (points > 0.5 small square). Ring and check a suspect plot. Tick if correct. Re-plot if i Work to an accuracy of half a small square.	ncorrect.	[1]
		ן ר ו	Line of best fit Judge by balance of at least 5 trend points about the car There must be an even distribution of points either si ength. Indicate best line if candidate's line is not the bes Lines must not be kinked.	de of the line alor	[1] ng the whole
		ļ	Quality Judge by scatter of all points about a straight line. All points in the table (minimum 5) must be within 50 mW Do not award if wrong graph or wrong trend.	of a straight line.	[1]

	Page 3		6	Mark Scheme: Teachers' version	Syllabus	Paper
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		(iii)	The Both If inc	dient hypotenuse of the triangle must be at least half the len n read-offs must be accurate to half a small square. correct, write in correct value. ck for $\Delta y / \Delta x$ (i.e. do not allow $\Delta x / \Delta y$).	igth of the drawn ∣	[1] ine.
			-	ercept from graph or substitute correct read-offs into <i>y</i> el FO.	= mx + c	[1]
	(e)	Uni	ts for	ient value and $b = y$ -intercept value. <i>a</i> and <i>b</i> are correct (expect WΩ ⁻⁴ for <i>a</i> and W for <i>b</i>). $a = 3 \times 10^{-9} \pm 1 \times 10^{-9}$ or SV ± 33%		[1] [1]
						[Total: 20]
2	(a)	(ii)		e of <i>d</i> , with consistent unit. Range of <i>d</i> : 5 ± 1 cm nearest mm.		[1] [1]
	(c)	(ii)		lence of repeated measurements of <i>t</i> either in (c)(ii) or le of <i>t</i> in range 5 to 30 s.	(e)(ii).	[1] [1]
	(d)	lf re	epeate	e uncertainty in <i>t</i> in the range 0.5 to 1.0 s. ed readings have been taken, then the uncertainty can calculation to get % uncertainty.	be half the range	[1]
	(e)	(ii)	Seco	ond value for <i>d</i> . ond value for <i>t</i> . lity: t_2 less than t_1 .		[1] [1] [1]
	(f)	(i)	Corr	rect calculation of two values of <i>k</i> or equivalent.		[1]
		(ii)		d conclusion based on the calculated values of <i>k</i> . didate must test against a specified criterion.		[1]
		(iii)	Justi	ification with reference to the significant figures in <i>t</i> and	1 d.	[1]

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(g)

	Limitations (4)	Improvements (4)	Ignore
A	A _p Two readings not enough (to support conclusion) / too few readings.	A _s Take more (sets of) readings <u>and</u> plot a graph / compare values of <i>k</i> .	Repeat readings
В	B _p Marker never exactly on 2 cm or 0.5 cm: either above or below / increments in changes in amplitude too large / difficult to judge 2 cm and 0.5 cm.	B _s Video with timer (playback) in slow motion / position sensor above with data logger / measure the amplitudes over time.	Use computer to improve the experiment. Multi-flash photography? Light gates.
С	C _p Straw not vertical (straight) / straw bumping into sides/ non-vertical oscillation.	C _s Wider container / glue straw / method of alignment.	No ref to changing oil
D	D _p Difficult to measure ' <i>d</i> ' because of lining up meniscus / refraction of curved container.	D _s Mark straw/ mark container / use travelling microscope / vernier calliper?	
E	E _p Difficult to measure time because moves past the marker quickly / small distances involved.	E _s Video with timer (playback) in slow motion / position sensor above with data logger. Credit once only.	

[Total: 20]