MARK SCHEME for the October/November 2012 series

9702 PHYSICS

9702/35

Paper 3 (Advanced Practical Skills 1), 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 should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2012 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.



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	-	J -		GCE AS/A LEVEL – October/November 2012	9702	35
1	(a)	(iv)	Valu	e for I_1 < 200 mA, with consistent unit.		[1]
			Valu I ₂ > 1	e for I_2 with unit of current. I_1		[1] [1]
	(b)	Six sets of readings of I_1 , I_2 and x scores 4 marks, five sets scores 3 marks etc. Incorrect trend -1. Major help from Supervisor -2. Minor help from Supervisor -1.				. [4]
		Ran	ige: x	$x_{\max} - x_{\min} \ge 0.500 \mathrm{m}.$		[1]
		Column headings: Each column heading must contain a quantity and a unit where appropriate. The unit must conform to accepted scientific convention e.g. I/A or $I(A)$, $1/x$ (m ⁻¹), I_1/I_2			[1]	
		Consistency: All values of <i>x</i> must be given to the nearest mm.				[1]
		Significant figures: All values of I_2/I_1 must have the same significant figures as, or one more than, the least number of significant figures in raw I_1 and I_2			[1] the	
		Calculation: Values of I_2/I_1 calculated correctly.			[1]	
	(c)	 (i) Axes: Sensible scales must be used, no awkward scales (e.g. 3:10). Scales must be chosen so that the plotted points occupy at least half the grap both <i>x</i> and <i>y</i> directions. Scales must be labelled with the quantity that is being plotted. Scale markings must be no more than three large squares apart. 		[1] graph grid in		
			All o Dian Cheo	ing of points: bservations in the table must be plotted on the graph gr neter of plots must be \leq half a small square. ck that the points are plotted correctly. Work to an accu the <i>x</i> and <i>y</i> directions.		[1] mall square in
			scatt	ity: oints in the table must be plotted (at least 5) for this ma er of all the points about a straight line. oints must be within $\pm 0.25 \text{m}^{-1}$ in the 1/x direction of a s		[1] Judge by the
			Judg Ther Allov canc	of best fit: le by balance of all the points on the grid (at least 5) abo e must be an even distribution of points either side of th v one anomalous point only if clearly indicated (i.e. circle lidate. must not be kinked or thicker than half a small square.	ne line along the	e full length.

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	 (iii) Gradient: The sign of the gradient must match the graph. The hypotenuse of the triangle used must be greater than half the length of the drawn line. Both read-offs must be accurate to half a small square in both the <i>x</i> and <i>y</i> directions. The method of calculation must be correct. 					
	<i>y</i> intercept: Either: Correct read-off from a point on the line and substitution into <i>y</i> = <i>mx</i> + <i>c</i> . Read-off must be accurate to half a small square in both the <i>x</i> and <i>y</i> directions. Or: Correct read-off of the intercept directly from the graph.					[1] ons.
	(d) Value of P = candidate's gradient and value of Q = candidate's intercept.Do not allow a value presented as a fraction.				[1]	
		Uni	t for F	^P (m or cm or mm, consistent with value) and Q (no unit) correct.	[1]
						[Total: 20]
2	(a)	(i)	Valu	e for <i>D</i> in range 10 to 20 mm to the nearest mm, with ur	nit.	[1]
	(ii) Percentage uncertainty in <i>D</i> based on an absolute uncertainty of 0.5, 1, 2 or 3 mm. If repeated readings have been taken, then the absolute uncertainty can be half the range. Correct method used to calculate the percentage uncertainty.					
	(b)	(ii)	Valu	ie of x to the nearest mm, in range $1.3 - 1.7$ cm, with unit	t.	[1]
		(iii)	Corr	rect calculation of V with consistent unit.		[1]
	(c)	(iv)	Raw	time values to 0.1 s or 0.01 s. Value of T in range 0.1 –	1.0s.	[1]
			Evid	ence of repeat measurements.		[1]
	(d)	(iv)	Seco	ond value of <i>x</i> .		[1]
		_	_			
	(e)) Second value of <i>T</i> .			[1]	
		Second value of $T <$ first value of T .				[1]
	(f)	(i)	Corr	rect calculation of two values of <i>k</i> .		[1]
		(ii)		ification of significant figures in <i>k</i> linked to significant figues in the significant figues (just "raw readings").	ures in <i>D, x</i> <u>and</u>	<u>1</u> time [1]
		(iii)	Sen: crite	sible comment relating to the calculated values of <i>k</i> , test rion.	ing against a s	pecified [1]

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(g)

	(i) Limitations 4 max.	(ii) Improvements 4 max.	Do not credit
A	two results not enough	take more readings <u>and plot a graph</u> / calculate more <i>k</i> values and <u>compare</u>	"repeat readings" on its own few readings/ only one reading take more readings and (calculate) average <i>k</i>
В	parallax error in <i>Dl</i> difficult to measure <i>D</i> <u>because</u> loop is in the way	use <u>Vernier</u> calipers/micrometer/travelling microscope to measure <i>D</i> *	use string
C	V not accurate because D not internal diameter	measure thickness/diameter of wire using micrometer use travelling microscope/ <u>Vernier</u> calipers to measure <i>D</i> *	
D	mass swings side-to-side/ horizontal movement/ moves in more than one plane/non- uniform oscillation		
E	times are small/large uncertainty in <i>T</i>	use bigger mass improved timing method e.g. motion/position sensor below weight/video with timer/video and view frame-by-frame**	light gates/ human error/reaction time/ time more cycles/ high frequency oscillations
F	difficult to judge start of/end of/complete oscillation	fixed/fiducial marker improved timing method e.g. motion/position sensor below weight/video with timer/video and view frame-by-frame**	marker fixed to spring/ marker placed at extreme(s) of oscillation light gates
G	metal strip bends/ not horizontal	use stiffer strip/ thicker strip/support strip at both ends.	strip not straight/ move spring/use stronger strip

* Credit in B_s or C_s , but not both. ** Credit in E_s or F_s , but not both.

[Total: 20]