MARK SCHEME for the May/June 2013 series

9702 PHYSICS

9702/34

Paper 3 (Advanced Practical Skills 2), 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 May/June 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.



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				GCE AS/A LEVEL – May/June 2013	9702	34	
1	(b)	(i)	Valu	e of d in the range 0.480 – 0.500 m, with unit.		[1]	
	(c)	 (c) Six sets of readings of <i>d</i> and <i>F</i> scores 6 marks, five sets scores 5 marks etc. Incorrect trend or no <i>d</i> data –1. Minor help from Supervisor –1, major help –2. Range: d_{max} – d_{min} ≥ 30 cm. 			[6]		
						[1]	
		Column headings: Each column heading must contain a quantity and a unit. The presentation of quantity and unit must conform to accepted scientific conventic e.g. 1/d / m ⁻¹ .					
		Consistency: All values of d must be given to the nearest mm and all values of F must be given to the nearest 0.1N. Significant figures: Significant figures for every row of values of $1/d$ same as, or one greater than, d as recorded in table.					
		Calculation: Values of 1/ <i>d</i> calculated correctly.				[1]	
	(d)	 (d) (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 gragrid in both <i>x</i> and <i>y</i> directions. Scales must be labelled with the quantity that is being plotted. Scale markings should be no more than three large squares apart. 		[1] raph			
			All o Poin	ing of points: bservations in the table must be plotted on the grid. ts must be plotted to an accuracy of half a small square neter of plotted points must be ≤ half a small square (no		[1]	
			awai	oints in the table must be plotted on the grid (at least 5) ded. Judge by the scatter of all the points about a straig ter of points must be less than ± 0.001 cm ⁻¹ from a strai	ght line.		
		. ,	Judg point the f One the c	of best fit: le by balance of all the points on the grid about the cand is). There must be an even distribution of points either s ull length. anomalous point is allowed only if clearly indicated (i.e. candidate. must not be kinked or thicker than half a square.	ide of the line	along	

Page 3		3	Mark Scheme	Syllabus	Paper	
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	(iii)	Gradient: [1] The hypotenuse of the triangle must be at least half the length of the drawn line. Both read-offs must be accurate to half a small square in both the x and y directions. The method of calculation must be correct.				
		Eithe	ect read-off from a point on the line substituted into $y =$		[1]	
		x an Or:	valent expression, with read-off accurate to half a small d y directions.			
			cept read directly from the graph, with read-off accurate oth <i>x</i> and <i>y</i> directions.	e to nall a small s	square	
(0	(e) Value of $a =$ candidate's gradient. Value of $b =$ candidate's intercept.				[1]	
	Unit for <i>a</i> correct and consistent with value, e.g. N cm. Unit for <i>b</i> is correct and consistent with value, e.g. N.				[1]	
					[Total: 20]	
2 (a	a) (i)		alues of <i>D</i> to nearest 0.01 cm or all to nearest 0.001 cm, e 3.0 to 5.0 mm.	, and in	[1]	
		Evid	ence of repeat readings of <i>D</i> .		[1]	
	(ii)	calcu If rep	blute uncertainty in <i>D</i> in range 0.02 to 0.05 cm and correct ulation to obtain percentage uncertainty. beated readings have been taken, then the absolute uncertainty for the second terms of terms		[1] half	
(0	c) (i)	<i>l</i> in r	ange 19.0 to 21.0 cm, with unit, to nearest mm.		[1]	
	(iii)	<i>t</i> in r	ange 2.0 to 10.0s and value(s) to nearest 0.1s or 0.01s		[1]	
	(iv)	Corr	ect calculation of <i>v</i> .		[1]	
(0	d) Jus	stificat	ion for s.f. in v linked to s.f. in D and t .		[1]	
(4	e) (ii)	Seco	ond value of <i>l.</i> ond value of <i>t.</i> ond value of <i>t</i> > first value of <i>t.</i>		[1] [1] [1]	
(1	f) (i)	Two	values of <i>k</i> calculated correctly.		[1]	
	(ii)		sible comment relating to the calculated values of <i>k</i> , test sified by the candidate.	ting against a cri	terion [1]	

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(g)

	(i) Limitations 4 max.	(ii) Improvements 4 max.	Do not credit
A	two readings are not enough (to draw a conclusion)	take more readings <u>and</u> plot a graph/take more readings and 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 k
B1	large uncertainty in <i>D</i> <u>because <i>D</i> is</u> <u>small</u>	measure outside diameter and wall thickness/measure an image showing the cross- section and a scale	use micrometer
B2	tube distorts when measuring D	use travelling microscope/measure volume and calculate <i>D</i>	
С	tube not straight so difficult to make tube vertical/tube not straight so difficult to measure length	tape to a straight rod/increase attached mass	use stiffer tube
D	difficult to judge moment (or operate stopwatch) <u>when level</u> <u>reaches syringe graduations</u>	use video with timer/view video frame by frame/collect water for a timed interval and measure volume/use light gates and timer with practical detail/use different diameter syringe with reason/use position sensor above water surface	'reaction time' on its own/human error / 'light gates' on its own/slow motion (or high speed) camera
E	difficult to see water level	use coloured water (or dye) /use clear syringe/view against black background	
F	clay stretches (or squashes) tube	measure length after attaching clay	

References to parallax error are ignored for this experiment.

[Total: 20]