## MARK SCHEME for the October/November 2014 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.

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Pag	e 2		Mark Scheme	Syllabus	Paper
		C	Cambridge International AS/A Level – October/November 2014	9702	34
1 (I	b) (	ii)	Value for $p$ in range 4.0 to 5.0 cm.		[1]
(0	c) (i	ii)	Value for <i>q</i> greater than <i>p</i> .		[1]
(0	d) (	Six Inco	sets of values for $p$ and $q$ scores 5 marks, five sets scores 4 marks prrect trend -1. Help from Supervisor -1.	etc.	[5]
	F A	Rar o va	nge: alues must include 3.0 cm or less and 5.0 cm or more.		[1]
	( E U	Coli Eac Unit 1 / <i>p</i>	umn headings: th column heading must contain a quantity and a unit where appropr ts should be shown using accepted scientific convention e.g. $1/p/cr$ (1/cm), and $q/p$ must have no unit.	iate. n <sup>−1</sup> or	[1]
	(	Cor All v	nsistency: /alues of <i>p</i> and <i>q</i> must be given to the nearest mm.		[1]
	e E i	Sigı Eve in th	nificant figures: ery value of 1 <i>/p</i> must be given to the same s.f. as (or one more than ne corresponding <i>p</i> .	) the s.f <i>.</i>	[1]
	(	Cal 1 <i>/ p</i>	culation: calculated correctly.		[1]
(4	e) (	(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 ha graph grid in 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.	alf the	[1]
			Plotting: All observations in the table must be plotted on the grid. Diameter of plotted points must be $\leq$ half a small square (no "blobs Plotted points must be accurate to within half a small square.	").	[1]
	(	ii)	Line of best fit: Judge by the balance of all points on the grid about the candidate's least 5 points). There must be an even distribution of points either side of the line a full length. Allow one anomalous plot only if clearly indicated by the candidate circled or labelled). Line must not be kinked or thicker than half a small square.	aline (at along the (i.e.	[1]

Page 3		3	Mark Scheme Syllabus			
			Cambridge International AS/A Level – October/November 2014	9702	34	
		(iii)	iii) Gradient: The hypotenuse must be greater than half the length of the drawn line. Both read-offs must be accurate to half a small square in both x and y directions.			
			<i>y</i> -intercept: Either: Read-off from a point on the line substituted into $y = mx + c$ . Read-of be accurate to half a small square in both <i>x</i> and <i>y</i> directions. Or: Correct read-off of the intercept directly from the graph.	ff must	[1]	
	(f)	a	a = gradient/(1 - intercept) and $b = intercept$ .		[1]	
		С	Correct and consistent units for <i>a</i> (e.g. cm) and no unit for <i>b</i> .			
		Qı	Quality: Value for <i>b</i> in range 1.40 to 1.55.			
					[Total: 20]	
2	(a)	(i)	Raw value(s) for <i>d</i> to nearest 0.01 cm or 0.001 cm and in range 0.5 to	o 1.5 cm.	[1]	
		(ii)	Value for <i>x</i> in range 2.2 to 2.8 cm.		[1]	
		(iii)	Raw value(s) of <i>l</i> to nearest mm or better.		[1]	
	(b)	Es 2 1 If I nc	Estimate of percentage uncertainty based on an absolute uncertainty of 2 to 5 mm and method of calculation correct. If repeated readings have been taken, then uncertainty can be half the range (but not zero) if the working is clearly shown.			
	(c)	Co	Correct calculation of A with consistent unit.			
	(d)	(v)	Value for <i>n</i> . Evidence of repeat measurements of <i>n</i> .		[1] [1]	
	(e)	Se	Second values of <i>x</i> and <i>l</i> .			
		Qı	Quality: <i>n</i> increases as <i>l</i> increases.			
	(f)	(i)	Correct calculation of two values of <i>k</i> .		[1]	
		(ii)	Justification based on the s.f. in $x$ , $d$ and $l$ . Ignore any reference to $n$	or A.	[1]	
		(iii)	Valid comment consistent with the calculated values of $k$ , testing aga <u>stated</u> criterion e.g. "The calculated percentage difference between $k$ is less than the percentage uncertainty in <b>(b)</b> , so the relationship is va	ainst a k values alid".	[1]	

Pag	e 4	4 Mark Scheme			Paper	
	Cambridge International AS/A Level – October/November 2014			9702	34	
(g)	Limitations (4 max.)		Improvements (4 max.)	Do not	Do not credit	
A	Tw a v	o readings are not enough to draw alid <u>conclusion</u>	Take many <i>A</i> values and plot a graph/take more readings and compare <i>k</i> values/repeat readings and plot graph	Repeat reading	Repeat/too few readings	
В	Dif jud sta froi	ficult to measure because hard to ge where parallel section of pencil rts/to judge where to measure m	Use a flat-ended rod			
С	Pencil not vertical		Use guides			
D	Dif cor	ficult to keep drop height nstant/drop height <u>not</u> constant	Use a stop <u>with detail</u> /use a fixed ruler behind strip/use pointer <u>with detail</u> e.g. pointer mounted in a stand	Difficult strip wit force/u marker	to release hout a se fiducial	
E	Difficult to judge when mark reaches surface because rice surface uneven		Use ring of card resting on rice around pencil/measure change in height of pencil	Rice sp containe experim	Rice spills out of container during experiment	
F	Dif hor hor	ficult to judge if strip is rizontal/strip may not be rizontal/strip is not horizontal	Measure (or compare) height at each end/use spirit level			
G	Conical section of pencil not taken into account					

[Total: 20]