CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Subsidiary and Advanced Level

MARK SCHEME for the May/June 2015 series

9702 PHYSICS

9702/32

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 2015 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.



Page 2	2	Mark Scheme	Syllabus	Paper
age 1		Cambridge International AS/A Level – May/June 2015	9702	32
(c)	(ii)	Value of <i>h</i> in the range 45.0 to 55.0 cm.		[1]
	(iii)	Value of x less than 50.0 cm.		[1]
(d)		sets of readings of x and h scores 5 marks, five sets scores 4 marks or or rect trend -1 . Help from Supervisor -1 .	s etc.	[5]
		nge: _x – x _{min} ≥ 60.0 cm.		[1]
	Ead pre	umn headings: ch column heading must contain a quantity and a unit where appropresentation of quantity and unit must conform to accepted scientific co . 1/h/cm ⁻¹ . x/h must have no unit.		[1]
		nsistency: values of x must be given to the nearest mm.		[1]
	Eve	nificant figures: ery value of x/h must be given to the same number of s.f. (or one months of s.f. in the corresponding values of x and h as recorded in tab	,	[1] e least
		culation: ues of <i>x</i> / <i>h</i> calculated correctly.		[1]
(e)	(i)	Axes: Sensible scales must be used. Awkward scales (e.g. 3:10) are not Scales must be chosen so that the plotted points occupy at least ha grid 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]
		Plotting: All observations must be plotted on the grid. Diameter of plotted pobe ≤ half a small square (no "blobs"). Plotted points must be accurate to within half a small square in both directions.		[1]
		Quality: All points in the table must be plotted (at least 5) for this mark to be Scatter of points must be no more than \pm 0.1 from a straight line in direction.		[1]
	(ii)	Line of best fit: Judge by balance of all points on the grid about the candidate's line points). There must be an even distribution of points either side of the full length. Allow one anomalous point only if clearly indicated (i.e. circled or lateral points).	the line alor	
		candidate. Lines must not be kinked or thicker than half a square.		

Page 2

Page	<u> </u>		aper		
		Cambridge International AS/A Level – May/June 2015 9702	32		
	(iii)	Gradient: The hypotenuse of the triangle must be greater than half the length of the drawn line. The method of calculation must be correct. Both read-offs must be accurate to half a small square in both the <i>x</i> and <i>y</i> directions.			
		 y-intercept: Either: Correct read-offs from a point on the line and substituted into y = mx + c or an equivalent expression. Both read-offs accurate to half a small square in both the x and y directions. Or: Intercept read directly from the graph, with read-off at x = 0 accurate to half a small 	[1] I		
		square in <i>y</i> direction.			
(f)	Val	ue of $a = \text{candidate's gradient and value of } b = \text{candidate's intercept.}$	[1]		
	Uni	its for a and b both correct and consistent with values.	[1]		
2 (a)	(ii)	All values of <i>D</i> to nearest 0.1 cm and in range 2.0 cm to 4.0 cm.	[1]		
		Evidence of repeat readings of <i>D</i> .	[1]		
	(iii)	Absolute uncertainty in D in range 0.2 to 0.5 cm and correct method of calculation to obtain percentage uncertainty. If repeated readings have been taken, then the absolute uncertainty can be half the range (but not zero) if the working is clearly shown.	[1]		
	(iv)	Correct calculation of C with consistent unit.	[1]		
(b)	Jus	stification for significant figures in C linked to significant figures in D only.	[1]		
(d)	(ii)	r_1 in range 5.0 cm to 25.0 cm, with unit, to nearest mm.	[1]		
	(v)	r_2 in range 5.0 cm to 25.0 cm.	[1]		
(e)	Sed	cond value of <i>D</i> .	[1]		
	Sed	cond values of r_1 and r_2 .	[1]		
	Sed	cond value of $ r_1 - r_2 >$ first value of $ r_1 - r_2 $.	[1]		
(f)	(i)	Two values of <i>k</i> calculated correctly.	[1]		
	(ii)	Sensible comment relating to the calculated values of k , testing against a criterion specified by the candidate.	[1]		

Mark Scheme

Page 3

Syllabus

Paper

Page 4	Mark Scheme		Paper
	Cambridge International AS/A Level – May/June 2015		32

(g)	(i) Limitations (4 max.)	(ii) Improvements (4 max.)	Do not credit
A	Two readings are not enough to draw a valid conclusion.	Take more readings <u>and</u> plot a graph/ obtain more <i>k</i> values and <u>compare</u>	"repeat readings"/ "few readings"/ only one reading/ take more readings and (calculate) average k
В	Difficult to measure <i>D</i> (or there is uncertainty in <i>D</i> or <i>C</i>) because loop is not circular/not flat/deforms	Workable method of making a more circular loop, e.g. wrap loop around tube	Use micrometer Use vernier calipers Material weak Material flexible
С	Parallax error with pointer/ pointer moves away from scale/ pointer (or spring) vibrates	Use shadow method	
D	Ruler not vertical	Use set square to ensure ruler vertical/clamp ruler	
Е	Difficult to judge reading when loop breaks away/ loop breaks away suddenly	Video with scale/ use maximum marker	Slow motion camera High speed camera Difficult to determine point (or moment) loop breaks away
F	Difficult to lower beaker steadily	Use adjustable-height stand	
G	Reading affected by contact between loop and beaker/ impurities in water	Use larger diameter container/ wider container Use distilled water	Larger beaker