CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the October/November 2012 series

9702 PHYSICS

9702/34

Paper 3 (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 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.



Page 2		Mark Scheme	Syllabus	Paper	
		GCE AS/A LEVEL – October/November 2012	9702	34	
(a) (iii) Value for I_0 in range 100 to 200 mA, with consistent unit.					
(b) l in range 40.0 to 60.0 cm, with consistent unit.					
 (c) Six sets of readings of l and I scores 5 marks, five sets scores 4 marks etc. -1 for minor help from Supervisor, -2 for major help. Incorrect trend / no l data / no I data then -1 					
Rar	nge: l	$l_{max} - l_{min} \geq 60 cm.$		[1]	
Eac The	Column headings: Each column heading must contain a quantity and a unit. The unit must conform to accepted scientific comvention e.g. I /mA or I (mA) or I/I (mA ⁻¹) but not I/I (mA) and not I/I (mA) ⁻¹ .				
	nsiste value:	ency: s of <i>l</i> must be given to the nearest mm		[1]	
Significant figures: All values of $1/I$ must be given to the same number of s.f. (or one more than) the s.f. in the corresponding values of I .				[1]	
		ed values: f 1/ <i>I</i> calculated correctly.		[1]	
(d) (i)	Scal the g Scal	s: sible scales must be used, no awkward scales (e.g. 3:10 les must be chosen so that the plotted points must occu graph grid in both x and y directions. les must be labelled with the quantity that is being plotte le markings must be no more than 3 large squares apar	py at least half	[1]	
	All th Dian Poin	ting of points: ne observations in the table must be plotted on the grid. neter of plots must be \leq half a small square. Its must be plotted accurately. Work to an accuracy of both x and y directions.	nalf a small squa	[1] are	
	Qua	lity: points in the table must be plotted (at least 5) for this relity is assessed by the scatter of the points about a ts must be within $0.025 \mathrm{m}^2$ (in the ℓ direction) of the line	straight line -		
(ii)	Judg cand Ther full le One labe	of best fit: ge by balance of all the points on the grid (at led didate's line. The must be an even distribution of points either side of ength. anomalous point is allowed only if clearly indicated lied) by the candidate. must not be kinked or thicker than half a square.	the line along	the	

1

Syllabus 9702 Paper 34

	(iii) Gradient: Value must be negative if graph gradient is negative. The hypotenuse of the triangle must be greater than half the length of the drawn line.	[1]
		Both read-offs must be accurate to half a small square in both <i>x</i> and <i>y</i> directions. Method of calculation must be correct.	,
		<i>y</i> -intercept: Either: Correct read-off from a point on the line, and substitution into $y = mx + c$.	[1]
		Read-off must be accurate to half a small square in both <i>x</i> and <i>y</i> directions. Or: Intercept read directly from the graph.	
(e	•	lue of $a = \text{candidate}$'s gradient and value of $b = \text{candidate}$'s intercept. value presented as a fraction is not allowed.	[1]
	Un	it for a consistent with value, e.g. mA ⁻¹ cm ⁻² .	[1]
			[Total: 20]
2 (a	ı) Va	lue of <i>d</i> in range 68.0 to 72.0 cm, with unit	[1]
(c	;) (i)	h_1 and h_2 recorded to nearest mm and $h_1 > h_2$.	[1]
	(ii)	Correct calculation of $\sin \theta$.	[1]
(d	l) Ju	stification for s.f. linked to s.f in (h_1-h_2) and s.f. in d .	[1]
(е	e) Ra	w values of <i>t</i> in range 1 to 20 s, with unit.	[1]
	Ev	idence of repeated measurements for <i>t</i> .	[1]
(f	or (or	rcentage uncertainty in <i>t</i> based on absolute uncertainty of 0.1 or 0.2 or 0.3 s half the range if it isn't zero). brect method of calculation to get percentage uncertainty.	[1]
(g	y) (ii)	Second values of h_1 and h_2 .	[1]
		Second value of t.	[1]
		Quality: t smaller for larger (h_1-h_2) .	[1]

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(h) (i) Correct calculation of two values of k.

[1]

(ii) Valid conclusion based on the calculated values of *k*. Candidate must test against a stated criterion.

[1]

(i)

	(i) Limitations 4 max.	(ii) Improvements 4 max.	Do not credit
A	two results not enough	take more readings <u>and plot a</u> <u>graph /</u> Calculate more <i>k</i> values and <u>compare</u>	'repeat readings' on its own / 'few readings' / 'take more readings and (calculate) average k' / 'only one reading'
В	rolling is erratic / marble not round / track uneven		too much friction
С	parallax error in measuring h	description of valid method of reducing parallax error in <i>h</i> (e.g. extend mark to wood or track / pointer on rule / travelling microscope*)	view at right angles / eye level / use shadow method
D	difficult to stop stopwatch at correct moment / reaction time (or human error) linked to stopping of stopwatch	use video of marble and clock / lightgate and timer motion sensor at end of track / view frame by frame	'timegates'/ 'timergates' / just 'reaction time'
E	small difference between h_1 and h_2 / large uncertainty in h_1 – h_2	use longer track*/ use (named) more precise method (e.g.travelling microscope*)	vernier caliper
F	difficult to release marble without applying a force / velocity	description of mechanical method of releasing (e.g. electromagnet with steel / magnetic material ball)	use a clamp / remote controlled clamp
G	t is small/ large uncertainty in t / ball moves fast so difficult to time accurately	use longer track*/ increase d	human reaction error

^{*} only credited once each.

Do not allow 'repeated readings'

Do not allow 'use a computer to improve the experiment'

[Total: 20]