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.				
-1 1	for mi	of readings of l and I scores 5 marks, five sets scores 4 nor help from Supervisor, -2 for major help. trend / no l data / no I data then -1	marks etc.	[5]
Rar	nge: l	$l_{\text{max}} - l_{\text{min}} \ge 60 \text{ cm}.$		[1]
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 .				
Cor	nsiste			[1]
All	value	nt figures: s of $1/I$ must be given to the same number of s.f. (or one the corresponding values of I .	e more than)	[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 es must be chosen so that the plotted points must occu graph grid in both <i>x</i> and <i>y</i> directions. es must be labelled with the quantity that is being plotte e markings must be no more than 3 large squares apar	py at least half	[1]
	All th Dian Poin	ing of points: ne observations in the table must be plotted on the grid. neter of plots must be \leq half a small square. ts must be plotted accurately. Work to an accuracy of hoth x and y directions.	nalf a small squa	[1] are
	Qua	lity: oints in the table must be plotted (at least 5) for this r lity 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 leading the lidate'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 t	he

1

Page 3		Mark Scheme	Syllabus	Paper
		GCE AS/A LEVEL – October/November 2012	9702	34
		Gradient: Value must be negative if graph gradient is negative. The hypotenuse of the triangle must be greater than halfdrawn line. Both read-offs must be accurate to half a small square directions. Method of calculation must be correct.		
		y-intercept: Either: Correct read-off from a point on the line, and substitution int Read-off must be accurate to half a small square in both x a Or: Intercept read directly from the graph.	•	[1]
(e)		blue of $a = candidate's$ gradient and value of $b = candidate's$ integrated as a fraction is not allowed.	ercept.	[1]
	Unit	for a consistent with value, e.g. mA ⁻¹ cm ⁻² .		[1]
				[Total: 20]
2 (a)	Valu	ue 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)) Just	ification for s.f. linked to s.f in (h_1-h_2) and s.f. in d .		[1]
(e)	Raw	values of <i>t</i> in range 1 to 20 s, with unit.		[1]
	Evid	lence of repeated measurements for t.		[1]
(f)	(or h	centage uncertainty in <i>t</i> based on absolute uncertainty of 0.1 half the range if it isn't zero). rect method of calculation to get percentage uncertainty.	or 0.2 or 0.3 s	[1]
(g)	(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]

Page 4 Mark Scheme		Syllabus	Paper
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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]