## **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>(b)</b> <i>l</i> in	range	e 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]	
Rai	nge: l	$l_{\text{max}} - l_{\text{min}} \ge 60  \text{cm}.$		[1]	
Ead The	ch col e unit	headings: umn heading must contain a quantity and a unit. must conform to accepted scientific comvention e.g. <i>I</i> /rnA <sup>-1</sup> ) but <u>not</u> 1/ <i>I</i> (mA) and <u>not</u> 1/ <i>I</i> (mA) <sup>-1</sup> .	mA or $I$ (mA)	[1]	
	nsiste value:	ncy: s of $\it l$ must be given to the nearest mm		[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)	Sens 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	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 hoth $x$ 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 $\ell^2$ 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 t	he	

1

Page 3		Mark Scheme	Syllabus	Paper	
		GCE AS/A LEVEL – October/November 2012	9702	34	
	<ul> <li>(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. Both read-offs must be accurate to half a small square in both x and y directions. Method of calculation must be correct.</li> </ul>				
	Eithe Corr Rea Or:	ercept: er: ect read-off from a point on the line, and substitution int d-off must be accurate to half a small square in both $x$ a reept read directly from the graph.		[1]	
(e)		a = candidate's gradient and value of $b$ = candidate's integrees ented as a fraction is not allowed.	ercept.	[1]	
	Unit for a	a consistent with value, e.g. mA <sup>-1</sup> cm <sup>-2</sup> .		[1]	
				[Total: 20]	
2 (a)	Value of	d in range 68.0 to 72.0 cm, with unit		[1]	
(c)	(i) h₁ a	and $h_2$ recorded to nearest mm and $h_1 > h_2$ .		[1]	
	(ii) Corr	rect calculation of $\sin  heta$ .		[1]	
(d)	Justificat	ion for s.f. linked to s.f in $(h_1-h_2)$ and s.f. in $d$ .		[1]	
(e)	Raw valu	ues of <i>t</i> in range 1 to 20 s, with unit.		[1]	
	Evidence	e of repeated measurements for t.		[1]	
(f)	(or half the	age uncertainty in <i>t</i> based on absolute uncertainty of 0.1 ne range if it isn't zero). method of calculation to get percentage uncertainty.	or 0.2 or 0.3 s	[1]	
(g)	(ii) Seco	and values of $h_1$ and $h_2$ .		[1]	
	Sec	ond value of t.		[1]	
	Qua	lity: $t$ smaller for larger $(h_1-h_2)$ .		[1]	

Page 4	Page 4 Mark Scheme		Paper
	GCE AS/A LEVEL – October/November 2012	9702	34

**(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

<sup>\*</sup> only credited once each.

Do not allow 'repeated readings'

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

[Total: 20]