## **CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**GCE Advanced Level** 

## MARK SCHEME for the May/June 2014 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 2014 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.



Page 2			Mark Scheme Syllabus		Paper	
			GCE A LEVEL – May/June 2014	9702	32	
(a)	(i)	Valu	te of $l_0$ in range 4.0 cm $\leq l_0 \leq$ 8.0 cm.		[1]	
(b) (	<b>(b) (iii)</b> Value of $h$ to nearest mm, in the range $40.0 \mathrm{cm} \le h \le 50.0 \mathrm{cm}$ .					
(c)			of values for $h$ and $l$ scores 5 marks, five sets scores 4 trend $-1$ . Help from Supervisor $-1$ .	1 marks, etc.	[5]	
	Ran <i>h</i> va	_	s must include 20 cm or less.		[1]	
	Column headings: Each column heading must contain a quantity and an appropriate unit. The presentation of quantity and unit must conform to accepted scientific convention, e.g. $1/h^2/\text{cm}^{-2}$ or $1/h^2$ ( $1/\text{cm}^2$ ) but not $1/h^2$ (cm <sup>2</sup> ).				[1] fic	
	Consistency: All values of $h$ and $l$ must be given to the nearest mm only.				[1]	
	Significant figures: Every value of $1/h^2$ must be given to the same s.f. as (or one greater than) the s.f. in the corresponding $h$ .					
		culat ues d	ion: of $(l-l_0)^2$ calculated correctly.		[1]	
(d)		Scal grap Scal	s: sible scales must be used, no awkward scales (e.g. 3:1 les must be chosen so that the plotted points occupy the grid in both <i>x</i> and <i>y</i> directions. les must be labelled with the quantity that is being plotte le markings must be no more than 3 large squares apar	y at least half the	[1] ne	
		Dian	ting: bservations in the table must be plotted. neter of plotted points must be ≤ half a small square (n k to an accuracy of half a small square.	o "blobs").	[1]	
			lity: points must be plotted (at least 5) for this mark to be ts must be within $\pm 10\mathrm{cm}^2$ of $(l-l_0)^2$ from a straight line.		[1] of	
	:	Line of best fit: Judge by balance of all points about the candidate's line (at least 5 points). There must be an even distribution of points either side of the line along the full length. Allow one anomalous plot only if clearly indicated (i.e. circled or labelled) by the candidate.				
			must not be kinked or thicker than half a small square.			

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L	Page 3		Mark Scheme	Syllabus	Paper
			GCE A LEVEL – May/June 2014	9702	32
	(iii)	The Both direc	dient: hypotenuse must be at least half the length of the drawn read-offs must be accurate to half a small squarections.  method of calculation must be correct.		[1] y
		Eithe Read be a Or:	ercept: er: d-off from a point on the line is substituted into $y = mx$ ccurate to half a small square in both $x$ and $y$ direction ck read-off of the intercept directly from the graph.		[1] ust
			e of the gradient, and $q$ = value of the intercept. onally correct units for $p$ and $q$ .		[1] [1] <b>[Total: 20]</b>
2	(a) (i)	Valu	e for $d$ to nearest mm, in range $1.0 \mathrm{cm} \le d \le 2.0 \mathrm{cm}$ .		[1]
	(ii)	Corr	ect calculation of <i>l</i> .		[1]
	(b) (ii)		e for $t$ in range 4.0s $\leq t \leq$ 10.0 s, with unit. ence of repeat readings of $t$ .		[1] [1]
	(c) (iii)	Valu	e for A to nearest mm, with unit.		[1]
	) If r	epeat ge (b	uncertainty in A in range 2 to 5 mm. ed readings have been taken, then absolute uncer ut not zero) only if working shown. nethod of calculation to obtain percentage uncertainty.	-	[1] half the
	` '		value of <i>t</i> . value of <i>A</i> .		[1] [1]
	(f) (i)		values of $k$ calculated correctly. range 0.20 to 0.30 cm s <sup>-2</sup> .		[1] [1]
	(ii)	Justi	ification based on the number of s.f. in $d$ , $n$ , $t$ and $A$ (no	ot just "raw readi	ngs"). [1]
	(iii)		d comment relating to the calculated values of $k$ , testified by the candidate.	esting against a	criterion [1]

Mark Scheme

Syllabus

Paper

Page 3

Page 4	Mark Scheme	Syllabus	Paper
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(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 (for different masses) <u>and</u> plot a graph, or take more readings <u>and</u> compare <i>k</i> values	Not enough repeat readings Few readings Idea of repeats "Too few readings/two readings" on its own
В	Difficult to measure <i>d</i> , with reason, e.g. parallax error/measuring outside diameter/loop gets in the way	Use <u>vernier</u> calipers/micrometer Measure inside and outside diameter and find average	"Parallax error" on its own "Calipers" on its own
С	Difficult to judge exactly when 10 oscillations completed	Video + timer/video and view frame-by-frame. Use distance sensor in stated and correct position Use a (fiducial) marker at centre of oscillation/equilibrium position Light gate at equilibrium position/centre of oscillation	Human/reaction time error  High speed cameras/slow motion cameras  Oscillations too fast
D	Mass swings as it oscillates/non-uniform oscillation/spring moves along bolt	Use tube to act as a guide Use deeper groove on bolt Fix top of spring to bolt with, e.g. Blu-tack/Sellotape	
E	Difficult to judge when contact is lost/hard to see gap	Use pressure sensor on bolt Use video close-up/zoom lens/ magnifying glass Video + slow-motion, linked to observing gap Better/more sensitive method of adjusting height of bolt, e.g. lab jack	"Video + slow motion" on its own
F	n is not a whole number	Measure <i>n</i> to nearest ¼ turn	

Do not credit use of an assistant, fans, air conditioning, or use of computers/data loggers on its own.

[Total: 20]