## UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS GCE Advanced Level

## MARK SCHEME for the May/June 2011 question paper for the guidance of teachers

## 9702 PHYSICS

9702/31

Paper 3 (Advanced Practical Skills 1), 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 must be read in conjunction with the question papers and the report on the examination.

• Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2011 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

1	(b)	(iii)		non-zero value an .5 V 1.5 V w		n unit.	[1] [1]
	(c)					ets scores 4 marks etc. -1; major help <i>–</i> 2.	[5]
		Range: Range of <i>I</i> at least 0.3 mA.				[1]	
		Column headings: Each column heading must contain a quantity and a unit where appropriate. There n some distinguishing mark between the quantity and the unit e.g. $V/V$ .					[1] here must be
	Consistency of presentation of raw readings: All values of <i>I</i> must be given to the same number of decimal places. All values given to the same number of decimal places.  Significant figures: Significant figures for 1/ <i>V</i> the same as, or one more than, that for <i>V</i> .				[1] of V must be		
					nan, that for <i>V</i> .	[1]	
		Cal	culation: Check th	he values of 1/V	and 1/ $I$ .		[1]
	(d)	(i)	be chosen so the both $x$ and $y$ directly lignore units.	nat the plotted porections. Scales a	oints on the grid must be labelle	e.g. 3:10) are not allowed. d occupy at least half the education of the december of the decemb	graph grid in
					nust be plotted.	Check the points are plot	

Mark Scheme: Teachers' version

GCE A LEVEL – May/June 2011

**Syllabus** 

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**Paper** 

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Work to an accuracy of half a small square.

[1

All points in the table must be plotted (at least 5) for this mark to be scored. Judge by the scatter of all points about a straight line. All points must be within 0.01  $V^{-1}$  on the 1/V axis from a straight line.

Do not accept blobs (points with diameter greater than half a small square).

(ii) Line of best fit:

Quality:

[1]

Judge by the balance of all the points (at least 5) about the candidate's line. There must be an even distribution of points either side of the line along the full length.

(iii) Gradient:

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[1]

The hypotenuse of the triangle must be at least half the length of the drawn line. Readoffs must be accurate to half a small square.

Intercept:

[1]

Either:

Check correct read-off from a point on the line, and substitution into y = mx + c. Read-off must be accurate to half a small square. Allow ecf of gradient value. Or:

Check the read-off of the intercept directly from the graph.

	Page 3			Mark Scheme: Teachers' version	Syllabus	Paper
				GCE A LEVEL – May/June 2011	9702	31
	(e)	Cor	rect r	method to find R.		[1]
		Ans	swer i	n range $40-60\Omega$ with unit.		[1]
						[Total: 20]
2	(a)	Mea	asure	ment of $t$ in the range 0.20 cm – 1.00 cm to 0.1 mm or	0.01 mm with u	nit. [1]
	(b)	(i)	Mea	surement of $d$ in the range 3 cm $-$ 9 cm with unit.		[1]
		(ii)	Corr	ect calculation of w.		[1]
	(c)	(ii)	Valu	te of $T$ in the range 3 s – 5 s.		[1]
			Evid	ence of repeat readings.		[1]
	(d)	If re	epeate	uncertainty in $T$ in range 0.1 s $-$ 0.6 s. ed readings have been taken, then the uncertainty can method of calculation of percentage uncertainty.	be half the rang	[1] e.
	(e)	Sec	ond v	value of <i>d</i> in the range 14 cm – 31 cm .		[1]
		Cor	rect o	calculation of second value of w.		[1]
		Sec	ond v	value of <i>T</i> .		[1]
		Sec	cond v	value of $T$ < first value of $T$ .		[1]
	(f)	(i)	Corr	ect calculation of two values of <i>k</i> .		[1]
		(ii)	Sens crite	sible comment relating to the calculated values of rion.	<i>k</i> , testing again	st a specified [1]

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(g)

	(i) Limitations 4 max	(ii) Improvements 4 max	Do not credit:
Α	Two readings are not	Take more readings and plot	Few readings
	enough	a graph/ calculate more k	Take more readings and
	(to draw a conclusion)	values (and compare)	calculate average <i>k</i>
		Allow 'repeat readings and plot a graph'	Only one reading
В	Rule hits bench	Method of preventing rule hitting bench	Ignore amplitude
		e.g. project end of cylinder over bench	changes/difficult to start
		or elevate apparatus	at the same amplitude
			each time
С	rule used for wider diameter/	Method to improve measurement of	Use larger Vernier
	couldn't use calipers	larger diameter e.g. use set squares	calipers
		held against ruler/wrap string or paper	
		around and measure	
		circumference/use calipers and hold	
		against ruler/travelling microscope	
D	Difficult to judge when	1.Use video (+ playback) + timer/use	Difficult to measure the
	oscillation is complete	clock on video / use position or motion	time/human error/
		sensor placed above/below rule (not	references to reaction
		above centre) / use of light gate with	times
		detailed method.	
		2.Use (fiducial) marker/pointer at centre	
		(of oscillation)	
E	Oscillations die away		
	quickly/too few oscillations/		
	damped		
F		Use same surface/material (for	
		cylinders)	

Ignore 'parallax problems', 'use assistant' or references to draughts, fans, air conditioning.

[Total: 20]