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## **UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**

GCE Advanced Subsidiary Level and GCE Advanced Level

## MARK SCHEME for the May/June 2010 question paper for the guidance of teachers

## 9702 PHYSICS

9702/32

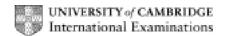
Paper 32 (Advanced Practical Skills), maximum raw mark 40

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 must be read in conjunction with the question papers and the report on the examination.

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

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Page 2			Mark Scheme: Teachers' version	Syllabus	Paper	
				GCE AS/A LEVEL – May/June 2010	9702	32
1	(b)	Six sets of values for $\it N$ and $\it I$ scores 5 marks, five sets scores 4 marks, etc. Incorrect trend $-1$ .			[5]	
			aratu or hel	is set up correctly without help from supervisor. Minor lp –2	help –1,	[2]
			ige – nclud	le <i>N</i> = 1 or 2 <u>and</u> <i>N</i> = 11 or 12.		[1]
		Column headings – Each column heading must contain a quantity and a unit where appropriate. Ignore units in the body of the table. There must be some distinguishing mark between the quantity and the unit (solidus is expected, but accept, for example, <i>I</i> (A))				[1]
				ncy of presentation of raw readings of $I$ – alues of $I$ must be given to the same number of decim	al places.	[1]
		Significant figures – S.f. for $1/I$ must be the same as, or one more than, the s.f. for $I$ . Check each row.				[1]
		Values of $1/I$ correct – Underline and check the specified value of $1/I$ . If incorrect, write in the correct value.				[1]
	(c)	<ul> <li>(i) Graph         Axes –         Sensible scales must be used. Awkward scales (e.g. 3:10) are not allowed.         Scales must be chosen so that the plotted points occupy at least half the         both x and y directions. Indicate false origin with FO.         Scales must be labelled with the quantity that is being plotted. Ignore units.         Allow inverted axes but do not allow the wrong graph.         Scale markings should be no more than three large squares apart.</li> </ul>		[1] graph grid in		
			Do n Ring	s – bservations must be plotted. Write a ringed total of plo ot accept blobs (points > half a small square). and check a suspect plot. Tick if correct. Re-plot if ind k to an accuracy of half a small square.		[1]
		` ,	Judg Ther lengt	of best fit – ye by the balance of at least 5 trend plots about the care must be an even distribution of points either side th. Indicate best line if candidate's line is not the best I must not be kinked or thicker than 1 mm.	e of the line alo	[1]
			All pl	lity – je by scatter of all points about a straight line. lots in the table must be within 10 $\Omega$ of a straight line. lot award if wrong graph or wrong trend.		[1]

Page 3				Syllabus	Paper			
			GCE A	S/A LEVEL	<ul><li>May/June</li></ul>	2010	9702	32
	(iii)	Both revalue. Check to y-interce	potenuse of the potential	t be accurate  do not allov  by substitut	e to half a so $\Delta x/\Delta y$ ).	mall square.	ength of the drawn of the draw	
(0	•	gradien		false origin.  H = intercept ution method				[1]
				$\leq H \leq -30 \Omega$ ution method		≤ <b>G</b> ≤ 5.5 V)	with appropriate	units. [1]
								[Total: 20]
2 (l	(b) (i) Value of maximum force to 1 d.p. in raw data and greater than 0 N Evidence of repeated measurements of F in (b)(i) or (d).		than 0 N.	[1] [1]				
	(ii)	Reache	es maximum	force sudder	nly (short tim	e); no notice	given when relea	ases. [1]
	(iii)	0.1N ≤	$\Delta F \leq 0.4 \text{ N}$	inty in maxin . If repeated ect ratio idea	readings ha		e then the uncer 00%).	[1] tainty could be
(0	c) (i)	Measur	rement of rav	v t to the nea	rest 0.01 mr	n.		[1]
	(ii)	Take re	epeats <u>in diff</u> e	erent places	/ (account fo	r) zero errors	S.	[1]
	(iii)	Maximu	um force with	three slides	. Unit require	ed.		[1]
(0	́Ме	asureme		ss of one slic um force with				[1] [1] [1]
(6	e) Cal	culation	of two values	s of <i>k</i> .				[1]
				on the calcul				[1]

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## (f)(i),(ii) Identify limitations and improvements

	Limitations (4)	Improvements (4)	Do not credit
Α	Two readings are not enough (to support conclusion	Take more (sets of) readings <u>and</u> <u>plot a graph</u>	Repeat readings.
В	Maximum force reached without warning (if not already credited in <b>(b)(ii)</b> )	<b>B</b> <sub>s</sub> Practical method of recording maximum value e.g. video with playback in slow motion / max-min newton metre / force sensor with data logger / masses with pulley.	Parallax error. Solution for parallax error. 'Use of computer' to measure maximum force.
С	t changes due to compression force of magnets / slide thickness non uniform (if not already credited) / thread thickness adds to separation.	Method of attaching newton meter without thread / measure and add thread thickness.	
D	Zero error on newton meter when used horizontally.	Adjust zero / practical vertical arrangement.	Condition of newton meter.
E	Glass may affect magnetic force / effect of surrounding magnetic materials (e.g. G clamp).	Use a variety of materials to separate magnets and test if material affects results / use a non magnetic clamp / glue first magnet to bench.	Reference to Earth's field.
F	Friction with bench.	Method of reducing friction.	
G	Difficulties with alignment of force with magnets.	Method of raising magnets / longer loop.	
X	Difficult to measure force due to weak magnets / small force (if validated by SR)	More sensitive newton meter.	

[Total: 20]