CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the October/November 2013 series

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 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 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.



Pa	ge z		wark Scheme	Syllabus	Paper
			GCE AS/A LEVEL – October/November 2013	9702	31
(a)	(i)	Valu	e for d in the range 0.15 mm $\leq d \leq$ 0.25 mm, with unit.		[1]
(c)	(ii)	Valu	es of V_1 and V_2 , and $V_1 > V_2$.		[1]
(d)			of readings of l , V_1 and V_2 scores 5 marks, five sets score from Supervisor –2. Minor help from Supervisor –1.	res 4 marks etc	. [5]
	Rar	nge: 🛭	<i>al</i> ≥ 30 cm.		[1]
	Column headings: Each column heading must contain a quantity and a unit where appropriate. The unit must conform to accepted scientific convention, e.g. $\it l/m$ or $\it l(m)$				[1]
	Consistency: [1 All values of raw $\it l$ must be given to the nearest mm.				
	Significant figures: ['Significant figures for every row of V_1/V_2 must be the same as, or one more than the least number of significant figures used in V_1 and V_2 .				
		culati ues o	on: f V_1/V_2 calculated correctly.		[1]
(e)	(i)	Scal both Scal	s: sible scales must be used, no awkward scales (e.g. 3:10 es must be chosen so that the plotted points occupy a x and y directions. es must be labelled with the quantity that is being plotte e markings should be no more than three large squares	at least half the d.	[1] graph grid in
		All o Dian	ing of points: bservations in the table must be plotted. neter of plotted point must be ≤ half a small square (no ' k to an accuracy of half a small square.	ʻblobs").	[1]
			lity: oints in the table must be plotted on the grid for this majorits must be within 0.05 (to scale) on the y-axis V_1/V_2 f		
	(ii)	Judg	of best fit : ge by balance of all points on the grid about the candida re must be an even distribution of points either side of th		

Mark Scheme

Syllabus

Paper

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1

Allow one anomalous point only if clearly indicated by the candidate.

Line must not be kinked or thicker than half a small square.

	Page 3		Mark Scheme	Syllabus	Paper
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	(iii)	Both	dient: hypotenuse of the triangle must be at least half the leng read-offs must be accurate to half a small square in bo method of calculation must be correct.		
	y-intercept: Either: Check correct read off from a point on the line and substituted into $y = mx$. Read-off must be accurate to half a small square in both x and y direction				
		Or:	ck read-off of the intercept directly from the graph.	,	
	(f) (i)	Valu	e of P = candidate's gradient. Value of Q = candidate's	intercept.	[1]
	(ii)	Valu	e of $ ho$ in range 1.0 – 20.0 × 10 ⁻⁷ Ω m		[1]
					[Total: 20]
2	(b) Va	lue of	m to the nearest 1g or better with consistent unit.		[1]
	(c) (ii)		surement of raw θ to nearest degree with unit. ence of repeat readings for θ .		[1] [1]
	(iii)		centage uncertainty in θ based on absolute uncertainty ided this is not zero), and correct method of calculation.	of 2 to 5° (or	half the range [1]
	(iv)	Corr	ect calculation of tan (θ /2).		[1]
	(d) (i)	Seco	ond value of $m > $ first value of m .		[1]
	(ii)		and value of θ . lity: second value of θ < first value of θ .		[1] [1]
	(e) Va	lue of	θ .		[1]
	(f) (i)	Two	values of <i>k</i> calculated correctly.		[1]
	(ii)	Just	ification of s.f. in k linked to significant figures in m and ℓ	9.	[1]
	(iii)		sible comment relating to the calculated values of <i>k</i> cified by the candidate.	r, testing agai	nst a criterion [1]

Mark Scheme

Syllabus

Paper

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(g)	(i) Limitations (4 max)	(ii) Improvements (4 max)	Do not credit
A	Two readings not enough (to draw a conclusion	Take more readings <u>and</u> plot a graph / take more readings and calculate more <i>k</i> values and compare	repeat readings / 'few readings' / 'take more readings and calculate average' / 'only one reading' / 'repeat readings' on its own
В	Difficult to measure θ because hook of mass (hanger) in the way / thick band	Tie thread to centre of bottom of rubber band and hang mass from it	
С	Difficult to hold the protractor steady / parallax error reading angle / protractor	Improved method to measure θ e.g. project image of stretched rubber band onto a screen / mark on board / measure lengths and calculate θ clamp protractor / take picture or video and measure angle	
D	Rubber band stretches over time	Take readings quickly / remove mass from rubber band between readings	
E	Stands moved / rods twist when loads attached to rubber band	Method of preventing movement of stands / clamp stands to bench / use nails in board	
F	Difficult to locate centre of band	Method of locating <u>and mark</u> centre e.g. measure and mark centre	
G	Change in θ small	Larger range of masses	

[Total: 20]