## MARK SCHEME for the May/June 2011 question paper

## for the guidance of teachers

## 9702 PHYSICS

9702/34

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 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.

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1	<ul><li>(c) Angle x, with unit.</li><li>(d) (iii) Angle y, greater than x.</li></ul>		[1]		
			[1]		
			of readings scores 4 marks, five sets scores 3 marks e trend then –1. Help from supervisor then –1.	etc.	[4]
	Ra	Range: <i>m</i> values must include 190 g or greater.		[1]	
	Ea	Column headings: Each column heading must contain a quantity and a unit where appropriate. There must be some distinguishing mark between the quantity and the unit, e.g. m/g.			
	All	l value	ncy of presentation of raw readings: s of <i>y</i> must be given to the nearest degree or half degr s of <i>m</i> must be given to the nearest gram (e.g. 190 g o		[1]
		-	nt figures: in $ heta$ must be the same as, or one more than, the s.f. gi	ven for $ heta$ .	[1]
	Ca	alculati	on: Values of sin $\theta$ calculated correctly.		[1]
	(f) (i)	Sens Scal grid Scal	s: sible scales must be used, no awkward scales (e.g. 3: es must be chosen so that the plotted points occup in both <i>x</i> and <i>y</i> directions. es must be labelled with the quantity that is being plott e markings must be no more than 3 large squares apa	y at least half th ted. Ignore units.	<b>-</b> .
		All o Cheo squa	ing of points: bservations in the table must be plotted. ck that the points are correctly plotted. Work to an a are. not accept blobs (points with diameter greater than half	-	
		-	lity: oints in the table must be plotted (at least 5) for this m ter of points must be less than ± 0.02 on the sin $\theta$ axis		
	(ii)	Judg	of best fit: ge by balance of all the points (at least 5) about the t be an even distribution of points either side of the line		

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	(iii)	The line.	Gradient: The hypotenuse of the triangle used must be at least half the length of the drawn line. Both read-offs must be accurate to half a small square. The method of calculation must be correct.		
		Eithe Che	Intercept: 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: Che	Dr: Check the read-off of the intercept directly from the graph.		
	(g) (ii)		Raw value(s) of $r$ in range 30 to 50 mm (or SV diameter/2 ± 10 mm) and given to earest mm, with unit.		given to [1]
		ethod of calculation of <i>a</i> is correct and uses the gradient value. nit for <i>a</i> has dimensions mass × length (e.g. g cm).			[1] [1]
					[Total: 20]
2	(a) (ii)		ie for <i>R</i> , with unit, in range 10 to 50 mm. neter is measured to determine <i>R</i> (either here or in <b>(d)</b>	).	[1] [1]
	(iii)		centage uncertainty in <i>R</i> calculated by correct ertainty of 0.5 mm or 1 mm or half the range of any repe		absolute [1]
	(b) (ii)		t measurement of $T$ , with unit, in range 0.5 s to 10.0 s. lence of repeat measurements of $T$ .		[1] [1]
	<b>(c)</b> Fire	st valu	ue of C calculated correctly, with correct unit (e.g. kgm	m²).	[1]
	(d) (ii)		ond value for <i>R</i> . ond value for <i>T</i> .		[1] [1]
		Qua	lity: Second $T <$ first $T$ .		[1]
		Sec	ond value of C calculated correctly.		[1]
	(e) (i)		values of <i>k</i> calculated correctly.		[1]
	(ii)		sible comment relating to the calculated values of <i>k</i> , te rion.	esting against a s	specified [1]

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(f)

	(i) Limitations 4 max	(ii) Improvements 4 max	Do not credit
Α	Two readings are not enough (to draw a conclusion)	Take more readings and plot a graph/calculate more <i>k</i> values (and compare). Allow 'repeat readings and plot a graph'	Few readings/take more readings and calculate average <i>k</i> /only one reading.
В	Difficult to judge the end of an oscillation.	<ol> <li>Use video (+ playback) + <u>timer</u>/use <u>clock</u> on video</li> <li>Use (fiducial) marker/ pointer, with reference point on mass hanger</li> </ol>	Difficult to measure the time/human error/references to reaction times/difficult to release from the same point each time. Data logging/light gates motion sensor/"release when marks line up".
С	Diameter/radius of a mass hanger not constant.		Comparison of diameters of 50 g and 100 g mass hangers.
D	Mass tends to swing as well as rotate.		Switch off fans.
E	<i>T</i> affected when rubber band extends.		
F		<u>Method</u> of measuring <u>diameter</u> . Use more precisely (e.g. vernier calipers).	
G		<u>Method</u> of <u>increasing</u> <i>T</i> (e.g. use larger mass/diameter or longer/thinner rubber band).	
Н	Labelled values of mass may not be accurate.	<u>Method</u> of finding mass (e.g. top pan balance).	

Do not allow "parallax error".

[Total: 20]