UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the October/November 2010 question paper for the guidance of teachers

9702 PHYSICS

9702/34

Paper 32 (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.

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(c) Measurements for h_1 and h_2 to nearest mm Check raw values if readings are repeated.				
The	diffe	rence between h_1 and h_2 is < 2 mm.		[1]
(d) (iii)	4 ma Inco	sets of readings of n , h_1 and h_2 scores 5 marks, five searks etc. rrect trend then -1 . If from supervisor then -1 .	ts scores	[5]
	Ran n va	ge – lues must include 10 or greater.		[1]
	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. h_1 /cm or h_1 (cm) but not $1/((h_1 - h_1)/\text{cm})$.			
		sistency of presentation of raw readings – alues of h_1 and h_2 must be given to the same precision	1.	[1]
		ificant figures – for $1/(h_1 - h_2)$ must be the same as, or one more than, $-h_2$).	, the s.f. in the d	[1] ifference
		culation – $(1 - h_2)$ calculated correctly.		[1]
(Graph)	Sens chos and	sible scales must be used, no awkward scales (e.g. sen so that the plotted points must occupy at least hall y directions.	f the graph grid	in both x
		es must be labelled with the quantity which is being ploe markings must be no more than 3 large squares apa		its.
	All o Do r Ring	ing of points – bservations must be plotted. not accept blobs (points with diameter > half a small sq and check a suspect plot. Tick if correct. Re-plot if in k to an accuracy of half a small square.		[1]
	Judo be a	of best fit – ge by balance of at least 5 trend points about the cand n even distribution of points either side of the line alon must not be kinked.		[1] ere must
	Scat	lity – ter of points must be less than ±0.02 on the 1/ <i>n</i> axis al oints must be plotted (at least 5) for this mark to be sc		[1] er's line.

Mark Scheme: Teachers' version

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(e) (iii) Gradient	EL – October/November 2010	9702	34
(e) (iii) Gradient The hypotenuse must be at least half the length of the drawn line. Both read-offs must be accurate to half a small square.		[1]	
Intercept Check that the read-off	or the method of calculation is corr	ect.	[1]
(f) Value of a = value of gradier Do not allow a value present	It and value of $b = value$ of interceped as a fraction.	ot.	[1]
Units for a and b are correct. E.g. cm ⁻¹ or m ⁻¹ but must be Allow no unit for b if $b = 0$.			[1]
			[Total: 20]
2 (a) (i) Value of d in range 5 cm Help from supervisor the			[1]
Evidence of repeated m	easurements of d.		[1]
(ii) Correct calculation of <i>A</i> . Do not allow a value in t			[1]
(b) (i) Measurement for x in ra	nge 0.8 cm < <i>x</i> < 1.0 cm to nearest r	nm.	[1]
(ii) Absolute uncertainty 1 of calculation.	or 2 mm (or half the range of repe	ats), and correct me	ethod [1]
(c) (ii) Measurement for h to no	earest mm.		[1]
(d) (iii) Value for $t > 1$ s and give Check raw data if there			[1]
(iv) Correct calculation of R,	with consistent unit (e.g. cm ³ s ⁻¹).		[1]
(e) (i) Values for <i>x</i> , <i>V</i> and <i>h</i> .			[1]
(ii) Correct trend (R increas	es with h).		[1]
(f) (i) Values of k calculated co	orrectly.		[1]
(ii) Valid conclusion based a stated criterion.	on the calculated values of <i>k</i> . Car	ndidate must test ag	ainst [1]

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(a)

	(i) Problems 4 max	(ii) Improvements 4 max	No credit/not enough
Α	Two readings are not enough (to draw a conclusion).	Take more readings, and plot a graph/calculate more <i>k</i> values.	More readings and calculate the average/ only one reading.
В	Bottle not circular/ diameter at P different to that at Q.	Collect water and measure volume/remeasure diameter at P.	
С	Bottle deforms when measuring <i>d</i> .	Use vernier callipers <u>to</u> measure <u>d</u> .	Use string to measure d.
D	Difficult to see water level/meniscus problems/refraction problems.	Use coloured water/liquid.	Use oil.
Е	Labels get wet/ink runs	Use waterproof labels/ink	
F	Difficult to judge when to start/stop timing.	Use video, with timing method.	Human reaction time error.
G	Large uncertainty in x.	Use travelling microscope to measure <i>x</i> .	
X	Another valid point E.g. Flowrate calculated is not the flowrate at <i>h</i> .	E.g. Measure <i>h</i> to point midway between marks.	Move marks closer together.

Ignore 'parallax problems' unless there is a convincing diagram.

Ignore 'use assistant'.

Ignore 'use distance sensor' unless there is a convincing diagram.

Ignore 'use a computer/datalogger/light gates'.

Ignore 'bottle not vertical'.

[Total: 20]