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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1	(c) Measurements for h_1 and h_2 to nearest mm Check raw values if readings are repeated.			[1]	
	The	e diffe	rence between h_1 and h_2 is < 2 mm.		[1]
	 (d) (iii) Six sets of readings of n, h₁ and h₂ scores 5 marks, five sets scores 4 marks etc. Incorrect trend then -1. Help from supervisor then -1. 			[5]	
		Rang <i>n</i> va	ge – lues must include 10 or greater.		[1]
		Eacl Ther	Imn headings – n column heading must contain a quantity and a unit w re must be some distinguishing mark between the qua- h_1 /cm or h_1 (cm) but not 1/(($h_1 - h_1$)/cm).		
	Consistency of presentation of raw readings – All values 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 di	[1] fference
			culation – $(1 - h_2)$ calculated correctly.		[1]
	(Graph)	Sens chos	s – sible scales must be used, no awkward scales (e.g. sen so that the plotted points must occupy at least hal <i>y</i> directions.		
		Scal	es must be labelled with the quantity which is being ple e markings must be no more than 3 large squares apa	-	ts.
		All o Do r Ring	ting 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 ir k to an accuracy of half a small square.	,	[1]
		Judg be a	of best fit – ge by balance of at least 5 trend points about the cano 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 a oints must be plotted (at least 5) for this mark to be sc		[1] er's line.

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(e) (iii)		Gradient The hypotenuse must be at least Both read-offs must be accurate		wn line.	
		Intercept Check that the read-off or the me	thod of calculation is corre	ect.	
(f)		e of <i>a</i> = value of gradient and va ot allow a value presented as a f		ot.	
	E.g	s for <i>a</i> and <i>b</i> are correct. cm ⁻¹ or m ⁻¹ but must be consiste v no unit for <i>b</i> if <i>b</i> = 0.	nt with the values.		
					[Total: 2
(a)	(i)	Value of <i>d</i> in range 5 cm to 15 cm Help from supervisor then –1.	1.		
		Evidence of repeated measurem	ents of <i>d</i> .		
	(ii)	Correct calculation of <i>A</i> . Do not allow a value in terms of <i>r</i>	τ.		
(b)	(i)	Measurement for <i>x</i> in range 0.8 c	m < x < 1.0 cm to nearest r	nm.	
	(ii)	Absolute uncertainty 1 or 2 mm of calculation.	(or half the range of repea	ats), and correct	method
(c)	(ii)	Measurement for <i>h</i> to nearest mr	n.		
(d) (iii)		Value for <i>t</i> > 1 s and given to 0.1 Check raw data if there are repe			
	(iv)	Correct calculation of <i>R</i> , with cor	sistent unit (e.g. cm ³ s ⁻¹).		
(e)	(i)	Values for <i>x</i> , <i>V</i> and <i>h</i> .			
	(ii)	Correct trend (<i>R</i> increases with <i>h</i>).		
(f)	(i)	Values of <i>k</i> calculated correctly.			
	(ii)	Valid conclusion based on the c a stated criterion.	alculated values of <i>k</i> . Car	ndidate must test	against

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	(i) Problems 4 max	(ii) Improvements 4 max	No credit/not enough
A	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> <u>measure <i>d</i>.</u>	Use string to measure <i>d</i> .
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, <u>with timing</u> <u>method</u> .	Human reaction time error.
G	Large uncertainty in <i>x</i> .	Use travelling microscope <u>to measure x</u> .	
Х	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]