## UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE A/AS Level

## MARK SCHEME for the November 2005 question paper

## 9702 PHYSICS

9702/02 Paper 2 maximum raw mark 60

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which Examiners were initially instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

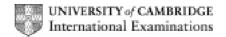
All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the *Report on the Examination*.

The minimum marks in these components needed for various grades were previously published with these mark schemes, but are now instead included in the Report on the Examination for this session.

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

CIE is publishing the mark schemes for the November 2005 question papers for most IGCSE and GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.



1	(a)	(i)	force per unit area (ratio idea esse	ential)	B1	
		(ii)	kg m <sup>-1</sup> s <sup>-2</sup>		B1	[2]
	(b)		ho has base unit kg m <sup>-3</sup> $g$ has base unit m s <sup>-2</sup> $h ho g$ has base unit m $ imes$ kg m <sup>-3</sup> $ imes$ m same as pressure QED	s <sup>-2</sup>	B1 B1 M1 A0	[3]
2	(a)	(a) point where whole weight of body (allow mass) may be <u>considered</u> to act (do not allow 'acts')		M1 A1	[2]	
	(b)		when CG below pivot, weight acts (so) weight has no turning effect a	•	B1 B1	[2]
3	(a)		change in velocity/time (taken)		B1	[1]
	(b)		velocity is a vector/velocity has madirection changing so must be according	•	B1 B1	[2]
	(c)		either 6.1 × cos35 = 4.99 N so no resultant vertical force 6.1 sin35 = 3.5 N horizontally	or scale shown triangle of correct shape resultant = $3.5 \pm 0.2 \text{ N}$ horizontal $\pm 3^{\circ}$	B1 B1 B1 B1	[4]
			allow answer based on centripetal resultant is centripetal force (which resultant is horizontal component of 6.1 sin35 = 3.5 N horizontally	n is horizontal)	(B1) (B1) (B1) (B1)	
4	(a)	(i)	use of tangent at time $t = 0$ acceleration = $42 \pm 4$ cm s <sup>-2</sup>		B1 A1	[2]
		(ii)	use of area of loop distance = $0.031 \pm 0.001$ m allow 1 mark if $0.031 \pm 0.002$ m)		B1 B2	[3]
	(b)	(i)	F = ma = 0.93 × 0.42 {allow e.c.f. from (a = 0.39 N	a)(i)}	C1	<b>[2]</b>
		(ii)	force reduces to zero in first 0.3 s then increases again in next 0.3 s		A1 B1 M1	[2]

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Syllabus 9702 Paper 2

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5	(a)		similarity: e.g. same wavelength/frequency/period, constant phase difference		
			difference: e.g. different amplitude/phase (do not allow a reference to phase for both similarity and difference)	B1	[2]
	(b)		constant phase difference so coherent	B1	[1]
	(c)	(i)	intensity ∞ amplitude²	C1	
			$I \propto 3^2$ and $I_{\rm B} \propto 2^2$ leading to $I_{\rm B} = \frac{4}{9}I$	M1 A0	[2]
		(ii)	resultant amplitude = $1.0 \times 10^{-4}$ cm resultant intensity = $\frac{1}{9}I$	C1 A1	[2]
	(d)	(i)	displacement = 0	B1	[1]
		(ii)	$x_{\rm A} = -2.6 \times 10^{-4}  {\rm cm} \ {\rm and} \ x_{\rm B} = +1.7 \times 10^{-4}  {\rm cm}$ allow $\pm 0.5 \times 10^{-4}  {\rm cm}$ ) resultant displacement = (-) $0.9 \times 10^{-4}  {\rm cm}$	C1 A1	[2]
				7.1	[4]
6	(a)		force must be upwards (on positive charge) so plate Y is positive	M1 A1	[2]
	(b)	(i)	E = V/d = 630/(0.75 × 10 <sup>-2</sup> ) = 8.4 × 10 <sup>4</sup> N C <sup>-1</sup>	C1	[0]
		(ii)	qE = mg $q = (9.6 \times 10^{-15} \times 9.8) / (8.4 \times 10^{4})$ $= 1.12 \times 10^{-18} \text{ C}$	A1 C1 C1 A1	[2]
7	(a)		either $V = E R_1 / (R_1 + R_2)$ or $I = E / (R_1 + R_2)$ = $\frac{1800}{3000} \times 4.50$ $V = \frac{1800}{3000} \times 4.50$ = 2.70 V = 2.70 V	C1 M1 A0	[2]
	(b)	(i)	for a wire, $V = I \times (\rho L/A)$ $I, \rho \text{ and } A \text{ are constant}$ so $V \propto L$	M1 A1 A0	[2]

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		(ii)	<b>1</b> 2.70 V		A1	[1]
			$2 \frac{L}{100} = \frac{2.70}{4.50}$		C1	
			L = 60.0  cm		A1	[2]
		(iii)	thermistor resistance decreases as temperature rise so QM is shorter	es	M1 A1	[2]
8	(a)		product of force and distance moved in the direction of the force		M1 A1	[2]
	(b)	(i)	falls from rest decreasing acceleration reaches a constant speed		B1 B1 B1	[3]
		(ii)	straight line with negative gradient $y$ -axis intercept above maximum $E_K$ reasonable gradient (same magnitude as that for $E_R$	∢initially)	B1 B1 B1	[3]