

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.

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1	(a)	(i)	force per unit area (ratio idea essential)	B1	
		(ii)	$\text{kg m}^{-1} \text{s}^{-2}$	B1	[2]
	(b)	ρ has base unit kg m^{-3} g has base unit m s^{-2} $h\rho g$ has base unit $\text{m} \times \text{kg m}^{-3} \times \text{m s}^{-2}$ same as pressure QED	B1 B1 M1 A0	[3]	
2	(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 through the pivot (so) weight has no turning effect about pivot	B1 B1	[2]	
3	(a)	<u>change</u> in velocity/time (taken)	B1	[1]	
	(b)	velocity is a vector/velocity has magnitude & direction direction changing so must be accelerating	B1 B1	[2]	
	(c)	<i>either</i> $6.1 \times \cos 35 = 4.99 \text{ N}$ so no resultant vertical force $6.1 \sin 35 = 3.5 \text{ N}$ horizontally	<i>or</i> scale shown triangle of correct shape resultant = $3.5 \pm 0.2 \text{ N}$ horizontal $\pm 3^\circ$	B1 B1 B1 B1	[4]
		<i>allow answer based on centripetal force:</i> resultant is centripetal force (which is horizontal) resultant is horizontal component of tension $6.1 \sin 35 = 3.5 \text{ N}$ horizontally	(B1) (B1) (B1) (B1)		
4	(a)	(i)	use of tangent at time $t = 0$ acceleration = $42 \pm 4 \text{ cm s}^{-2}$	B1 A1	[2]
		(ii)	use of area of loop distance = $0.031 \pm 0.001 \text{ m}$ allow 1 mark if $0.031 \pm 0.002 \text{ m}$)	B1 B2	[3]
	(b)	(i)	$F = ma$ $= 0.93 \times 0.42$ {allow e.c.f. from (a)(i)} $= 0.39 \text{ N}$	C1 A1	[2]
	(ii)	force reduces to zero in first 0.3 s then increases again in next 0.3 s in the opposite direction	B1 M1 A1	[3]	

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

- (ii) 1 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 rises
so QM is shorter M1
A1 [2]
- 8 (a) product of force and distance M1
moved in the direction of the force A1 [2]
- (b) (i) falls from rest B1
decreasing acceleration B1
reaches a constant speed B1 [3]
- (ii) straight line with negative gradient B1
y-axis intercept above maximum E_K B1
reasonable gradient (same magnitude as that for E_K initially) B1 [3]