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**

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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.

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1 **(a)** **(i)** force per unit area (ratio idea essential) B1

(ii) kg m^{-1} s^{-2} B1 **[2]**

(b) ρ has base unit kg m^{-3} B1
g has base unit m s^{-2} B1
$h\rho g$ has base unit m × kg m^{-3} × m s^{-2} M1
same as pressure QED A0 **[3]**

2 **(a)** point where whole weight of body (allow mass) M1
may be considered to act (do not allow 'acts') A1 **[2]**

(b) when CG below pivot, weight acts through the pivot B1
(so) weight has no turning effect about pivot B1 **[2]**

3 **(a)** change in velocity/time (taken) B1 **[1]**

(b) velocity is a vector/velocity has magnitude & direction B1
direction changing so must be accelerating B1 **[2]**

(c)

either 6.1 × cos35 = 4.99 N	*or* scale shown	B1	
so no resultant vertical force	triangle of correct shape	B1	
6.1 sin35 = 3.5 N	resultant = 3.5 ± 0.2 N	B1	
horizontally	horizontal ± 3°	B1	**[4]**

allow answer based on centripetal force:
resultant is centripetal force (which is horizontal) (B1)
resultant is horizontal component of tension (B1)
6.1 sin35 = 3.5 N (B1)
horizontally (B1)

4 **(a)** **(i)** use of tangent at time t = 0 B1
acceleration = 42 ± 4 cm s^{-2} A1 **[2]**

(ii) use of area of loop B1
distance = 0.031 ± 0.001 m B2 **[3]**
allow 1 mark if 0.031 ± 0.002 m)

(b) **(i)** $F = ma$ C1
= 0.93 × 0.42 {allow e.c.f. from (a)(i)}
= 0.39 N A1 **[2]**

(ii) force reduces to zero in first 0.3 s B1
then increases again in next 0.3 s M1
in the opposite direction A1 **[3]**

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5 **(a)** similarity: e.g. same wavelength/frequency/period, constant phase difference — B1

difference: e.g. different amplitude/phase — B1 **[2]**
(do not allow a reference to phase for both similarity and difference)

(b) constant phase difference so coherent — B1 **[1]**

(c) **(i)** *intensity* $\propto$ *amplitude*^{2} — C1

$I \propto 3^2$ and $I_B \propto 2^2$ leading to — M1

$I_B = \frac{4}{9} I$ — A0 **[2]**

(ii) resultant amplitude = 1.0×10^{-4} cm — C1

resultant intensity = $\frac{1}{9} I$ — A1 **[2]**

(d) **(i)** displacement = 0 — B1 **[1]**

(ii) $x_A = -2.6 \times 10^{-4}$ cm and $x_B = +1.7 \times 10^{-4}$ cm — C1
allow $\pm 0.5 \times 10^{-4}$ cm)
resultant displacement = (-) 0.9×10^{-4} cm — A1 **[2]**

6 **(a)** force must be upwards (on positive charge) — M1
so plate Y is positive — A1 **[2]**

(b) **(i)** $E = V / d$ — C1
$= 630/(0.75 \times 10^{-2})$
$= 8.4 \times 10^4$ N C^{-1} — A1 **[2]**

(ii) $qE = mg$ — C1
$q = (9.6 \times 10^{-15} \times 9.8) / (8.4 \times 10^4)$ — C1
$= 1.12 \times 10^{-18}$ C — A1 **[3]**

7 **(a)** *either* $V = E R_1 / (R_1 + R_2)$ *or* $I = E / (R_1 + R_2)$ — C1

$= \frac{1800}{3000} \times 4.50$ $\quad$ $V = \frac{1800}{3000} \times 4.50$ — M1

$= 2.70$ V $\quad$ $= 2.70$ V — A0 **[2]**

(b) **(i)** for a wire, $V = I \times (\rho L / A)$ — M1
I, ρ *and* A are constant — A1
so $V \propto L$ — A0 **[2]**

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	(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		M1	
		so QM is shorter		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]**

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