

NOVEMBER 2002

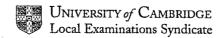
GCE Advanced Level

MARK SCHEME

MAXIMUM MARK: 60

SYLLABUS/COMPONENT:9702/4

PHYSICS (STRUCTURED QUESTIONS (A2 CORE))



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					,
1	(a)	(i)	$Q = mc\Delta\theta \qquad \dots$	C 1	
			$2300 = 0.75 \times c \times (100 - 20) / 120$ (if uses ± 273 , then -2)	C1	
			$c = 4600 \mathrm{J kg^{-1} K^{-1}} \dots (allow 1 sf) \dots$	A1	
		(ii)	Q = mL	C1	
			$2300 = (0.375 / 420) \times L$		
			$L = 2.6 \times 10^6 \mathrm{J kg^{-1}}$ (alow 1 sf)	A1	[5]
	(b)		e.g. heat losses, power not constant etc	M1	
			(do not allow if releated to s.h.c., rather than l.h.c.)		
-			effect on value for L	Αļ	[2]
		_	34 22 128 1412		
2	(a)	E = I	$hc/\lambda = (6.63 \times 10^{-34} \times 3.0 \times 10^{8})/(486 \times 10^{-9})$	Cl	
			$= 4.09 \times 10^{-19} \mathrm{J}$ (allow 2 sf)	Al	[2]
	(b)		energy level drawn at $4.09 \times 10^{-19} \mathrm{J}$		
			transition 4.09×10^{-19} to zero clear		
			transition 4.09×10^{-19} to 3.03×10^{-19} clear	B1	[3]
			(-1 for reversed arrows, -1 for extra level at 1.06)		
_					
3	(a)		constant amplitude		
		(ii)	period = 0.75 s (allow $\pm 0.2 \text{ s}$)	Cl	
			$\omega = 2\pi/T$		
			$\omega = 8.4 \text{ rad s}^{-1} \dots (-1 \text{ for } 1 \text{ sf}) \dots$		
		(iii)	either use of gradient or $v = \omega y_0$	C1	
			$v = 0.168 \text{ m s}^{-1}$	Al	[6]
			(allow ± 0.02 for construction: gradient drawn at wrong place $0/2$)		
	(b)	1	1.3 Hz	B1	
		(ii)	at $\frac{1}{2}f_0$, 'pulse' provided to mass on alternate/some oscillations	M1	F. 0.7
			so 'pulses' build up the amplitude	Al	[3]
					-
A	(~)	(i)	$1/m^2 - GMm/P$	D 1	
4	(a)	(1)	$\frac{1}{2}mv^2 = GMm/R$ $v^2 = 2GM/R$	BI	
		(::)	2		
		(ii)	$g = GM/R^2$ clear algebra giving $v^2 = 2gR$	IVI i A 1	[2]
			oteal algebra giving v — 2gh	A1	[3]
	(b)		$\frac{1}{2}mv^2 = 3/2kT$		
	(U)		$v^2 = 3kT/m$	C1	,
			3kT/m = 2gR	C1	
			$T = (2 \times 6.6 \times 10^{-27} \times 9.81 \times 6.4 \times 10^{6}) / (1.38 \times 10^{-23} \times 3) \dots$	C1	
			$T = 2.0 \times 10^4 \mathrm{K} \qquad \dots $		[4]
			2.0 ^ 10 1k	A.I	[7]

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two capacitors in series 5 (a) in parallel with second series pair or any correct combination B1 [2] two capacitors in series in parallel with a single capacitor (b) [2] or other correct combination B2 (leads not shown, then -1 overall) e.g. E-field, force independent of speed, B-field, force ∝ speed ... B2 6 (a) E-field, force along field direction, B-field, force normal etc ... B2 [4] (b) (i) $mv^2/r = Bqv$ (ii) [4] (c) (i) $E = 0.12 \times 4.5 \times 10^6$ A1 $= 5.4 \times 10^5 \text{ V m}^{-1}$ [3] (d) [1] 7 (a) (i) (ii) as direction of movement changes, so does e.m.f. B1 [4] **(b)** $= 2090 \text{ rad s}^{-1}$ C1 $x = 1.5 \sin 2090t$ A1 [4]

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8	(a)	probability of decay of a nucleus	[2]
	(b)	$A = \lambda N$ (ignore sign) B1	[1]
	(c) (i) (ii) (iii)	1 m ³ contains 1 / 0.024 = 41.7 mol	[5]