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## CAMBRIDGE INTERNATIONAL EXAMINATIONS

## **NOVEMBER 2002**

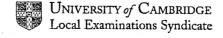
## **GCE Advanced Level**

## MARKSCHEME

**MAXIMUM MARK: 60** 

SYLLABUS/COMPONENT:9702/4

PHYSICS (STRUCTURED QUESTIONS (A2 CORE))



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					,
1	(a)	(i)	$Q = mc\Delta\theta$	C1	
	` `	•	$2300 = 0.75 \times c \times (100 - 20) / 120$ (if uses $\pm 273$ , then $-2$ )	C1	•
			$c = 4600 \mathrm{J  kg^{-1}  K^{-1}}$ (allow 1 sf)	<b>A</b> 1	
		(ii)	Q = mL	<b>C</b> 1	
		,	$2300 = (0.375 / 420) \times L$		
			$L = 2.6 \times 10^6 \mathrm{J  kg^{-1}}$ (alow 1 sf)	<b>A</b> 1	[5]
					r. 1
	<b>(b)</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	Al	[2]
-				,	LJ
					-
2	(a)	E = I	$hc/\lambda = (6.63 \times 10^{-34} \times 3.0 \times 10^{8})/(486 \times 10^{-9})$	C1	
_	(,-)	7	$= 4.09 \times 10^{-19} \text{J}$ (allow 2 sf)	Al	[2]
					[~]
	<b>(b)</b>		energy level drawn at $4.09 \times 10^{-19} \mathrm{J}$	B1	
	(2)		transition $4.09 \times 10^{-19}$ to zero clear		
			transition $4.09 \times 10^{-19}$ to $3.03 \times 10^{-19}$ clear		[3]
			(-1 for reversed arrows, -1 for extra level at 1.06)	DI	
			(-1 for feversed diffews, -1 for extra lever at 1.00)		
3	(a)	(i)	constant amplitude	R1	
•	()	(ii)	period = $0.75 \text{ s}$ (allow $\pm 0.2 \text{ s}$ )		
		(11)	$\omega = 2\pi/T \qquad \qquad \ldots$	CI	
			$\omega = 8.4 \text{ rad s}^{-1} \dots (-1 \text{ for } 1 \text{ sf})$	A1	
		(:::\			
		(iii)	either use of gradient or $v = \omega y_0$		[6]
			(allow ±0.02 for construction: gradient drawn at wrong place 0/2)	AI	լսյ
			(anow 10.02 for constitution. gradient drawn at wrong place 0/2)		
	<b>(b)</b>	(i)	1.3 Hz	B1	
	(0)	(ii)	at ½f <sub>0</sub> , 'pulse' provided to mass on alternate/some oscillations	M1	
		(11)	so 'pulses' build up the amplitude		[3]
				4 8.1	וֹכּוֹ
4	(a)	(i)	$\frac{1}{2}mv^2 = GMm/R$	B1	
-		(-)	$v^2 = 2GM/R \qquad \dots$	A0	
		(ii)	$g = GM/R^2 \qquad$		
		( )	clear algebra giving $v^2 = 2gR$	Al	[3]
	<b>(b)</b>		$\frac{1}{2}mv^2 = 3/2kT$		
	. ,		$v^2 = 3kT/m \qquad \dots $	C1	
			$3kT/m = 2gR \qquad \dots$	<b>C</b> 1	
			$T = (2 \times 6.6 \times 10^{-27} \times 9.81 \times 6.4 \times 10^{6}) / (1.38 \times 10^{-23} \times 3)$	<b>C</b> 1	
			$T = 2.0 \times 10^4 \mathrm{K}$		[4]
					r.1

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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) or other correct combination ...... B2 [2] (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] out of plane of paper (not 'upwards')......Bl (b) (i) (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) [4] **(b)**  $= 2090 \text{ rad s}^{-1}$ ..... C1  $x = 1.5 \sin 2090t$ ..... A1 [4]

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	erical desired and the second		

8	(a)	probability of decay of a nucleus	[2]
	(b)	$A = \lambda N$ (ignore sign) B1	[1]
	(c) (i) (ii) (iii)	1 m <sup>3</sup> contains 1 / 0.024 = 41.7 mol	
		= 210 Bq A1	[5]