CAMBRIDGE
INTERNATIONAL EXAMINATIONS

NOVEMBER 2001

ADVANCED SUBSIDIARY LEVEL

MARK SCHEME

MAXIMUM MARK : 60

SYLLABUS/COMPONENT : 8702/2

PHYSICS
(STRUCTURED QUESTIONS)

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

Categorisation of marks

The marking scheme categorises marks on the *MACB* scheme.

B marks: These are awarded as independent marks, which do not depend on other marks. For a B mark to be scored, the point to which it refers must be seen specifically in the candidate's answer.

M marks: These are method marks upon which A-marks (accuracy marks) later depend. For an M-mark to be scored, the point to which it refers must be seen in the candidate's answer. If a candidate fails to score a particular M-mark, then none of the dependent A-marks can be scored.

C marks: These are compensatory method marks which can be scored even if the points to which they refer are not written down by the candidate, providing subsequent working gives evidence that they must have known it. For example, if an equation carries a C-mark and the candidate does not write down the actual equation but does correct working which shows he/she knew the equation, then the C-mark is awarded.

A marks: These are accuracy or answer marks which either depend on an M-mark, or allow a C-mark to be scored.

Conventions within the marking scheme

Brackets: Where brackets are shown in the marking scheme, the candidate is not required to give the bracketed information in order to earn the available marks.

Underlining: In the marking scheme, underlining indicates information that is essential for marks to be awarded.

1	mass:	property of body which resists change in motion OR quantity/amount of matter/substance	B1	
		constant OR scalar quantity	B1	
	weight:	effect of gravitational field on a mass/body OR force due to pull of gravity	B1	
		variable OR vector quantity	B1	**[4]**
		(if units given, allow ½ for 2nd and 4th marks)		
2 (a)		use of $h = ut + \frac{1}{2}at^2$ and $u = 0$ (accept $h = \frac{1}{2}at^2$)	B1	
		gradient of graph = $\frac{1}{2}g$	B1	
		gradient = 0.7 / (0.225 – 0.082) =4.9 ± 01	C1	
		g = 9.8 m s^{-2}	A1	**[4]**
		(single point solution or gradient = g, max 2/4)		
(b)		e.g. measurement of h OR t	M1	
		repeat measurement and average	A1	**[2]**
3 (a)		sum of forces in any direction is zero (allow vector/algebraic sum, resultant force…)	B1	
		sum of moments about any point is zero (allow algebraic sum, resultant…)	B1	**[2]**
		(If no mention of direction or point, allow max ½ overall)		

3 (b)		same force F in both springs	C1	
		resultant is $2F\cos60$ OR scale drawing	M1	
		resultant is F, so extension is x	A1	[3]
		(maximum $\frac{1}{3}$ if uses x alone, without reference to kx)		
3 (c)	(i)	correct direction for W	B1	
	(ii)	correct direction for T	B1	
	(iii)	correct direction for R	B1	[3]
4 (a)		$m = \rho V$	B1	[1]
(b)		pressure in liquid depends on depth	B1	
		bottom of sphere has greater pressure on it than top	M1	
		so resultant force <u>or</u> pressure is upwards	A1	[3]
(c)	(i)	**1.** kinetic energy $= \frac{1}{2}mv^2$	C1	
		$= \frac{1}{2} \times 2 \times 10^{-3} \times (6 \times 10^{-2})^2$		
		$= 3.6 \times 10^{-6}$ J	A1	
		2. potential energy $= mgh$	C1	
		rate of loss $= mgv$	C1	
		$= 2 \times 10^{-3} \times 9.8 \times 6 \times 10^{-2}$		
		$= 1.2 \times 10^{-3}$ J s^{-1}	A1	[5]
		(no reference to time in **2.**, maximum $\frac{2}{3}$)		
	(ii)	potential energy of sphere is given/lost to the liquid	B1	
		to overcome drag forces or to produce eddies or friction etc	B1	[2]
5 (a)		copper and aluminium (-1 for each error or omission)	B2	[2]
(b)	(i)	A is brittle		
		B is ductile		
		C is polymeric (-1 each error or omission)	B2	[2]
		(named materials, all correct, allow $\frac{1}{2}$)		
	(ii)	work done is represented by area under graph	C1	
		$(\frac{1}{2} \times 2 \times 10^{-3} \times 3) + (2 \times 10^{-3} \times 3.1)$	C1	
		work done $= 9.2 \times 10^{-3}$ J (1 s.f. –1)	A1	[3]
6 (a)	(i)	$c = f\lambda$	C1	
		$\lambda = (3.00 \times 10^8) / (4.8 \times 10^{14})$		
		$= 625 \times 10^{-9}$ m	C1	
		number of wavelengths $= (0.1 \times 10^{-3}) / (625 \times 10^{-9})$	M1	
		$= 160$	A0	[3]
	(ii)	pattern seen due to diffraction (at each slit)	M1	
		for large amount of diffraction, wavelength is about slit width	A1	
		not so here, so very little diffraction	A1	[3]
(b)		$\lambda = ax / D$	C1	
		$x = (625 \times 10^{-9} \times 2.6) / 1.5 \times 10^{-3}$	C1	
		$= 1.1$ mm	A1	[3]

	(c)		fringe separation is unchanged	B1	
			bright fringes are brighter	B1	
			dark fringes stay dark	B1	**[3]**
			(allow $\frac{1}{2}$ for fringes brighter/more contrast but $\frac{0}{2}$ for more intense)		
7	**(a)**	**(i)**	$P = V^2/R$ OR $P = VI$ <u>and</u> $V = IR$	B1	
			algebra clear	B1	
			leading to $R = 2.4\,\Omega$	A0	**[2]**
		(ii)	$R = \rho L / A$	C1	
			$2.4 = (4.9 \times 10^{-7} \times L) / \pi \times (0.27 \times 10^{-3})^2$	C1	
			$L = 1.12$ m	A1	**[3]**
	(b)	**(i)**	$I_1 + I_2 = I_3$	B1	**[1]**
		(ii)	**1.** $E_1 = I_1R_1 + I_3R_2$	B1	
			2. $E_1 - E_2 = I_1R_1 - I_2R_3$	B1	**[2]**
8	**(a)**		118	B1	**[1]**
	(b)		path: correct shape	M1	
			in correct position relative to nucleus	A1	**[2]**
	(c)		smaller deviation	B1	**[1]**