

November 2003

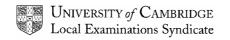
GCE ADVANCED SUBSIDIARY LEVEL AND ADVANCED LEVEL

MARK SCHEME

MAXIMUM MARK: 60

SYLLABUS/COMPONENT: 9702/02

PHYSICS
Paper 2 (Structured Questions (AS))



Page 1	Mark Scheme	Syllabus	Paper
	A/AS LEVEL EXAMINATIONS - NOVEMBER 2003	9702	02

Categorisation of marks

The marking scheme categorises marks on the MACB scheme.

B marks: These are awarded as <u>independent</u> 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 <u>method</u> 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 <u>compensatory</u> 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 <u>answer</u> 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.

Page 2	Mark Scheme	Syllabus	Paper
	A/AS LEVEL EXAMINATIONS - NOVEMBER 2003	9702	02

1	(a)	(i)	acceleration (allow a definition of acceleration)	B1	
		(ii)	the velocity is decreasing or force/acceleration is in negative direction – accept 'body is decelerating'/'slowing down'	B1	[2]
	(b)	(i)	e.g. separation of dots becomes constant/does not continue to increase (must make a reference to the diagram)	B1	
		(ii)1	distance = 132 cm	B1	
		(ii)2	at constant speed, distance travelled in 0.1 s = 25 cm (allow ± 1 cm) distance = 132 + (4 x 25) = 232 cm		[4]
	(c)		$s = ut + \frac{1}{2}at^2$ 1.6 = $\frac{1}{2}$ x 9.8 x t^2 (allow $g = 10$ m s^{-2}	C1	[3]
2	(a)		mass: measure of body's resistance/inertia to changes in velocity/motion	B1 B1	[3]
	(b)		e.g. where gravitational field strength changes (change) in fluid surrounding body 1 each, max 2	B2	[2]
3	(a)		force x perpendicular distance		[2]
	(b)		no resultant force (in any direction)no resultant moment (about any point)		[2]
	(c)	(i)	correct direction in both	B1	[1]
		(ii)1	moment = 150 x 0.3 = 45 N m (1 sig. fig1)	A1	
		(ii)2	torque = 45 N m i.e. same is (i)	A1	
		(ii)3	45 = 0.12 x <i>T</i>		[4]
4	(a)	(i)1	amplitude = 0.4(0) mm	A1	
		(i)2	wavelength = $7.5 \times 10^{-2} \text{ m}$ (1 sig. fig1 unless already penalised)	A1	
		(i)3	period = 0.225 ms		
		(i)4	$v = f\lambda$ = 4400 x 7.5 x 10 ⁻² = 330 m s ⁻¹		[6]

Page 3		}	Mark Scheme	Syllabus	Paper
		<u> </u>	A/AS LEVEL EXAMINATIONS - NOVEMBER 2003	9702	02
	(a)	(ii)	reasonable shape, same amplitude and wavelength de	oubled B1	[1]
	(b)	(i)	1.7(2) μm	A1	
		(ii)	d $\sin \theta = n\lambda$ (double slit formula scores 0/2) 1.72 x 10 ⁻⁶ x $\sin \theta = 590$ x 10 ⁻⁹		
		(iii)	½L = 1.5 tan20.1 L = 1.1 m		[5]
5	(a)	(i)	arrow from B towards A	B1	
		(ii)	E = V/d = 450/(9.0 x 10 ⁻²) = 5.0 x 10 ³ N C ⁻¹ (accept 1 sig. fig)	C1 A1	[3]
	(b)	(i)	energy = qV or Eqd	A1	
		(ii)	Ek = $\frac{1}{2}mv^2$ 7.2 x 10 ⁻¹⁷ = $\frac{1}{2}$ x 9.1 x 10 ⁻³¹ x v^2	C1	[4]
	(c)		line from origin, curved in correct direction but not 'lev	el out'B1	[1]
6	(a)	(i)	26 protons	B1	
		(ii)	30 neutrons	B1	[2]
	(b)	(i)	mass = $56 \times 1.66 \times 10^{-27}$		
		(ii)	density = mass/volume where volume = $4/3 \times \pi \times r^3$ = $(9.3 \times 10^{-26})/(4/3 \times \pi \times \{5.7 \times 10^{-15}\}^3)$ = 1.2×10^{17} kg m ⁻³	C1	[4]
	(c)		nucleus occupies only very small fraction of volume of or 'lot of empty space inside atom'(do not allow spacing between atoms) any further good physics e.g. nuclear material is very	<u>f atom</u> B1	
7	(a)	(i)	P = Vi 1200 = 240 x i i = 5.0 A	M1	
		(ii)	V = iR 240 = 5.0 x R		[4]
	(b)	(i)	p.d. = (5.0 x 4.0 =) 20 V	A1	
		(ii)	mains voltage = (240 + 20 =) 260 V	A1	
		(iii)	P = (20 x 5.0 =) 100 W	A1	[3]
	(c)		power input = 1200 + 100 = 1300 W efficiency = 1200/1300 = 0.92		[2]