MARK SCHEME for the October/November 2010 question paper

for the guidance of teachers

9702 PHYSICS

9702/21 Paper 2 (AS Structured Questions), maximum raw mark 60

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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UNIVERSITY of CAMBRIDGE International Examinations

Page 2		Mark Scheme: Teachers' ver	sion Syllabus	Paper	
		GCE AS/A LEVEL – October/November 2010 9702		21	
1		th, current, temperature, amount of substanc <i>three, 1 each</i>	e, (luminous intensity)	B3	[3]
	(b) (i)	<i>F</i> : kg m s ⁻² ρ : kg m ⁻³ <i>v</i> : m s ⁻¹		B1 B1 B1	[3]
	(ii)	some working e.g. kg m s ⁻² = m ² kg m ⁻³ (m s ⁻¹ hence $k = 2$	⁻¹) ^k	M1 A1	[2]
2	(a) (i)	horizontal speed constant at 8.2 m s ⁻¹ vertical component of speed = 8.2 tan 60° = 14.2 m s ⁻¹		C1 M1 A0	[2]
	(ii)	$14.2^2 = 2 \times 9.8 \times h$ (using $g = 10$ then -1) vertical distance = 10.3 m		C1 A1	[2]
	(iii)	time of descent = 14.2 / 9.8 = 1.45 s		C1	
		x = 1.45 × 8.2 = 11.9 m		A1	[2]
	(b) (i)	smooth path curved and above given path hits ground at more acute angle		M1 A1	[2]
	(ii)	smooth path curved and below given path hits ground at steeper angle		M1 A1	[2]
3	(a) for	e = rate of change of momentum (allow	w symbols if defined)	B1	[1]
	(b) (i)	$\Delta \rho = 140 \times 10^{-3} \times (5.5 + 4.0) = 1.33 \text{ kg m s}^{-1}$		C1 A1	[2]
	(ii)	force = 1.33 / 0.04 = 33.3 N		M1 A0	[1]
	(c) (i)	taking moments about B (33 × 75) + (0.45 × g × 25) = F_A × 20 F_A = 129 N		C1 C1 A1	[3]
	(ii)	F _B = 33 + 129 + 0.45 <i>g</i> = 166 N		C1 A1	[2]

	Page 3	Mark Scheme: Teachers' version Syllabus	Paper	
		GCE AS/A LEVEL – October/November 2010 9702	21	
4	(a) (i) /	=/A	B1	[1]
	(ii)	NL / L	B1	[1]
	(iii) a	allow $FL / A \Delta L$	B1	[1]
	(iv) a	allow $\rho L / A$ or $\rho (L + \Delta L) / A$	B1	[1]
	(b) (i) /	$\Delta L = FL / EA$ = (30 × 2.6) / (7.0 × 10 ¹⁰ × 3.8 × 10 ⁻⁷) = 2.93 × 10 ⁻³ m = 2.93 mm	M1 A0	[1]
	(ii)	$\Delta R = \rho \Delta L / A$ = (2.6 × 10 ⁻⁸ × 2.93 × 10 ⁻³) / (3.8 × 10 ⁻⁷)	C1	
		$= (2.0 \times 10^{-4} \Omega)^{-4} \Omega$	A1	[2]
	• •	ge in resistance is (very) small ethod is not appropriate	M1 A1	[2]
5	• •	a wave passes through a slit / by an edge vave spreads out / changes direction	M1 A1	[2]
	(b) diagr	am: wavelength unchanged wavefront flat at centre, curving into geometrical shadow	M1 A1	[2]
	(c) <i>d</i> sin		C1	
	1 / (6	$= 90^{\circ}$ 50 × 10 ³) = <i>n</i> × 590 × 10 ⁻⁹	M1	
	<i>n</i> = 2 numb	.6 ber of orders is 2	A1	[3]
	(d) inten	sity / brightness decreases (as order increases)	B1	[1]
6	(a) (i) e	wither $P = V^2 / R$ or $P = VI$ and $V = IR$ $R = 4.0 \Omega$	C1 A1	[2]
	(sketch vertical axis labelled appropriately straight) line from origin then curved in correct direction line passes through 12 V, 3.0 A	B1 B1 B1	[3]
	(b) (i) 2	2.0 kW	A1	[1]
	(ii) (0.5 kW	A1	[1]
		otal resistance = 3 <i>R</i> / 2 power = 0.67 kW	C1 A1	[2]

	Page 4		Mark Scheme: Teachers' version	Syllabus	Paper	,
			GCE AS/A LEVEL – October/November 2010	9702	21	
7	(a)	<i>either or</i> differe	different forms of same element <u>nuclei</u> have same number of protons nt numbers of neutrons (in the nucleus)		M1 A1	[2]
	(b)	nu	oton number conserved cleon number conserved ass-energy conserved		B1 B1 B1	[3]
		(ii) 1. 2.	Z = 36 x = 3		A1 A1	[1] [1]