MARK SCHEME for the May/June 2013 series

9702 PHYSICS

9702/23

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 should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.



	Page	2	Mark Scheme	Syllabus	Paper	•
		GCE AS/A LEVEL – May/June 2013 9		9702	23	
1	(a) for	rce: kg	m s ⁻²		A1	[1]
	(b) (i)		² <i>l</i> : m x: m g m s ⁻² Α ⁻²		C1 A1	[2]
	(ii)		e of the correct shape (for inverse proportionality) rly approaching each axis but never touching the axis		M1 A1	[2]
	(iii)	curv	ing upwards and through origin		A1	[1]
2	(a) (i)	1. d	istance of path / along line AB		B1	[1]
			hortest distance between AB / distance in straight line be r displacement from A to B	etween AB	B1	[1]
	(ii)	acce	eleration = rate of change of velocity		A1	[1]
	(b) (i)	dista	ance = area under line or $(v/2)t$ or $s = (8.8)^2 / (2 \times 9.81)$ = 8.8 / 2 × 0.90 = 3.96 m or $s = 3.95$ m = 4(.0) m		C1 A1	[2]
	(ii)	acce	eleration = $(-4.4 - 8.8) / 0.50$ = $(-) 26(.4) \text{ m s}^{-2}$		C1 A1	[2]
	(c) (i)	the a	accelerations are constant as straight lines		B1	
		no a	accelerations are the same as same gradient or ir resistance as acceleration is constant or nge of speed in opposite directions (one speeds up one	slows down)	B1	[2]
	(ii)		under the lines represents height E at trampoline equals PE at maximum height		B1	
		seco	ond area is smaller / velocity after rebound smaller hence	e KE less	B1	
		hend	ce less height means loss in potential energy		A0	[2]
3	(a) (i)		otal momentum of a system (of interacting bodies) rema ided there are no resultant external forces / isolated sys		M1 A1	[2]
	(ii)		tic: total kinetic energy is conserved, inelastic: loss of kir w elastic: relative speed of approach equals relative spe	•••	B1	[1]

	Page	3	Mark Scheme	Syllabus	Paper	
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	(b) (i)	final	al mom: $4.2 \times 3.6 - 1.2 \times 1.5$ (= $15.12 - 1.8 = 13.3$) mom: $4.2 \times v + 1.5 \times 3$ ($13.3 - 4.5$) / $4.2 = 2.1 \mathrm{m s^{-1}}$		C1 C1 A1	[3]
	(ii)	final initia prov	al kinetic energy = $\frac{1}{2} m_A (v_A)^2 + \frac{1}{2} m_B (v_B)^2$ = 27.21 + 1.08 = 28(.28) kinetic energy = 9.26 + 6.75 = 16 al KE is not the same as final KE hence inelastic vided final KE less than initial KE w in terms of relative speeds of approach and separation	n]	M1 M1 A1	[3]
4	(a) (i)	stres	ss = force / cross-sectional area		B1	[1]
	(ii)	strai	in = extension / <u>original</u> length		B1	[1]
	(b) (i)	E =	stress / strain 0.17 × 10 ¹² ss = 0.17 × 10 ¹² × 0.095 / 100 = 1.6(2) × 10 ⁸ Pa		C1 C1 C1 A1	[4]
	(ii)	force	e = (stress × area) = 1.615 × 10 ⁸ × 0.18 × 10 ⁻⁶ = 29(.1)N		C1 A1	[2]
5	• •		aves overlap / meet Itant displacement is the sum of the individual displacem	ents of the waves	B1 B1	[2]
	(b) (i)	1 . p	whase difference = $180^{\circ} / (n + \frac{1}{2}) 360^{\circ}$ (allow in rad)		B1	[1]
		2. p	phase difference = 0 / 360° / (n360°) (allow in rad)		B1	[1]
	(ii)		fλ 320 / 400 = 0.80 m		C1 A1	[2]
	(iii)	-	$\begin{array}{l} \text{difference} = 7 - 5 = 2 \text{ (m)} \\ = 2.5 \lambda \end{array}$		M1	
			ce minimum naximum if phase change at P is suggested		A1	[2]
6	(a) p.d	l. = <u>wo</u>	ork done / energy transformed (from electrical to other fo charge	rms)	B1	[1]
	(b) (i)	max	imum 20 V		A1	[1]
	(ii)	mini	mum = (600 / 1000) × 20 = 12 V		C1 A1	[2]

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	(c)	(i)		of 1.2 kΩ 00 + 1/600 = 1/ <i>R</i> , <i>R</i> = 400 Ω		M1 A1	[2]
		(ii)		parallel resistance (R_2 + LDR) is less than R_2 imum) p.d. is reduced		M1 A1	[2]
7	(a)	(i)	nucle outs mos total diam	eus contains 92 protons eus contains 143 neutrons (missing 'nucleus' 1/2) ide / around nucleus 92 electrons t of atom is empty space / mass concentrated in nucleus charge is zero neter of atom ~ 10^{-10} m or size of nucleus ~ 10^{-15} m two of (B1) marks		B1 (B1) (B1) (B1) (B1)	[4]
		(ii)		eus has same number / 92 protons ei have 143 and 146 neutrons (missing 'nucleus' 1/2)		B1 B1	[2]
	(b)	(i)	Y = 3 Z = 8			A1 A1	[2]
		(ii)	mas	s-energy is conserved in the reaction		B1	
				s on rhs of reaction is less so energy is released ained in terms of $E = mc^2$		B1	[2]