UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

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.

• CIE will not enter into discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the October/November 2010 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.



Page 2	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE AS/A LEVEL – October/November 2010	9702	21

- 1 (a) length, current, temperature, amount of substance, (luminous intensity) any three, 1 each
- B3 [3]

(b) (i) F: kg m s⁻² ρ : kg m⁻³ v: m s⁻¹

B1 B1 B1

(ii) some working e.g. $kg m s^{-2} = m^2 kg m^{-3} (m s^{-1})^k$ hence k = 2

M1 A1 [2]

[3]

2 (a) (i) horizontal speed constant at 8.2 m s^{-1} vertical component of speed = $8.2 \text{ tan } 60^{\circ}$ = 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 $x = 1.45 \times 8.2$ = 11.9 m C1 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) force = rate of change of momentum
- (allow symbols if defined)
- B1 [1]

(b) (i) $\Delta \rho = 140 \times 10^{-3} \times (5.5 + 4.0)$ = 1.33 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 $(33 \times 75) + (0.45 \times g \times 25) = F_A \times 20$

 $F_{\rm A} = 129 \ {\rm N}$

C1 C1

Α1

(ii) $F_B = 33 + 129 + 0.45g$ = 166 N

C1 A1 [2]

[3]

	Page 3	Mark Scheme: Teachers' version Syllabus	Paper	
		GCE AS/A LEVEL – October/November 2010 9702	21	
4	(a) (i) F/	4	B1	[1]
	(ii) ∆ <i>L</i> /	'L	B1	[1]
	(iii) allo	w FL/AΔL	B1	[1]
	(iv) allo	w $\rho L/A$ or $\rho (L + \Delta L)/A$	B1	[1]
	(b) (i) Δ <i>L</i>	= FL / EA = $(30 \times 2.6) / (7.0 \times 10^{10} \times 3.8 \times 10^{-7})$ = 2.93×10^{-3} m = 2.93 mm	M1 A0	[1]
		= $\rho \Delta L / A$ = $(2.6 \times 10^{-8} \times 2.93 \times 10^{-3}) / (3.8 \times 10^{-7})$	C1	
		$= 2.0 \times 10^{-4} \Omega$	A1	[2]
	` '	in resistance is (very) small od is not appropriate	M1 A1	[2]
5	` '	wave passes through a slit / by an edge e spreads out / changes direction	M1 A1	[2]
	(b) diagram	wavelength unchanged wavefront flat at centre, curving into geometrical shadow	M1 A1	[2]
	(c) $d \sin \theta =$		C1	
	for $\theta = 90^{\circ}$ 1 / (650 × 10 ³) = n × 590 × 10 ⁻⁹		M1	
	n = 2.6 number	of orders is 2	A1	[3]
	(d) intensity	/ brightness decreases (as order increases)	В1	[1]
6	(a) (i) eith	er $P = V^2/R$ or $P = VI$ and $V = IR$ $R = 4.0 \Omega$	C1 A1	[2]
	(stra	tch vertical axis labelled appropriately aight) line from origin then curved in correct direction appropriately passes through 12 V, 3.0 A	B1 B1 B1	[3]
	(b) (i) 2.0	kW	A1	[1]
	(ii) 0.5	kW	A1	[1]
	` '	I resistance = 3 <i>R</i> / 2 ver = 0.67 kW	C1 A1	[2]

	Page 4		Mark Scheme: Teachers' version Syllabus	Pape	r
			GCE AS/A LEVEL – October/November 2010 9702	21	
7	(a)	eithe or diffe	er different forms of same element nuclei have same number of protons rent numbers of neutrons (in the nucleus)	M1 A1	[2]
	(b)	()	proton number conserved nucleon number conserved mass-energy conserved	B1 B1 B1	[3]
		` '	1 . <i>Z</i> = 36 2 . <i>x</i> = 3	A1 A1	[1] [1]