## 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

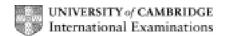
Paper 2 (AS Structured Questions), maximum raw mark 60

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

(b) (i) F: kg m s<sup>-2</sup>  $\rho$ : kg m<sup>-3</sup> v: m s<sup>-1</sup>

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  $8.2 \text{ m s}^{-1}$ vertical component of speed =  $8.2 \text{ tan } 60^{\circ}$ =  $14.2 \text{ m s}^{-1}$ 

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<sup>-1</sup> C1 A1 [2]

(ii) force = 1.33 / 0.04 = 33.3 N

M1 A0 [1]

(c) (i) taking moments about B  $(33 \times 75) + (0.45 \times g \times 25) = F_A \times 20$ 

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

Α1

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

C1 A1 [2]

[3]

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4	(a) (i) /		B1	[1]
4				
	(ii) /		B1	[1]
	` '	allow FL/A\DL	B1	[1]
	(iv) a	allow $\rho L/A$ or $\rho (L + \Delta L)/A$	B1	[1]
	(b) (i) A	$\Delta L = FL/EA$		
		= $(30 \times 2.6) / (7.0 \times 10^{10} \times 3.8 \times 10^{-7})$ = $2.93 \times 10^{-3}$ m = $2.93$ mm	M1 A0	[1]
	(ii) /	$\Delta R = \rho \Delta L / A$	C1	
		= $(2.6 \times 10^{-8} \times 2.93 \times 10^{-3}) / (3.8 \times 10^{-7})$ = $2.0 \times 10^{-4} \Omega$	A1	[2]
	` '	ge in resistance is (very) small ethod is not appropriate	M1 A1	[2]
5		n 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) $d \sin \theta = n\lambda$ for $\theta = 90^{\circ}$		C1	
		$50 \times 10^3) = n \times 590 \times 10^{-9}$	M1	
		per of orders is 2	A1	[3]
	(d) inten	sity / brightness decreases (as order increases)	B1	[1]
	(,			
6	(a) (i) 6	either $P = V^2/R$ or $P = VI$ and $V = IR$ $R = 4.0 \Omega$	C1 A1	[2]
	(ii) s	sketch vertical axis labelled appropriately	B1	[-]
	(	straight) line from origin then curved in correct direction line passes through 12 V, 3.0 A	B1 B1	[3]
			51	ر∼ا
	(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]
	ŀ	5.57 KW	73.1	[ <del>-</del> ]

	Page 4		Page 4 Mark Scheme: Teachers' version		Paper	•
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7	(a)	either or differe	different forms of same element nuclei have same number of protons nt numbers of neutrons (in the nucleus)		M1 A1	[2]
	(b)	n.	oton number conserved icleon number conserved ass-energy conserved		B1 B1 B1	[3]
		` '	Z = 36 $x = 3$		A1 A1	[1] [1]