## 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		th, current, temperature, amount of substanc <i>three, 1 each</i>	e, (luminous intensity)	B3	[3]
	(b) (i)	<i>F</i> : kg m s <sup>-2</sup> $\rho$ : kg m <sup>-3</sup> <i>v</i> : m s <sup>-1</sup>		B1 B1 B1	[3]
	(ii)	some working e.g. kg m s <sup>-2</sup> = m <sup>2</sup> kg m <sup>-3</sup> (m s <sup>-1</sup> hence $k = 2$	<sup>-1</sup> ) <sup>k</sup>	M1 A1	[2]
2	(a) (i)	horizontal speed constant at 8.2 m s <sup>-1</sup> vertical component of speed = 8.2 tan 60° = 14.2 m s <sup>-1</sup>		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 <sub>B</sub> = 33 + 129 + 0.45 <i>g</i> = 166 N		C1 A1	[2]

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4	(a) (i) /	=/A	B1	[1]
	<b>(ii)</b>	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 <sup>10</sup> × 3.8 × 10 <sup>-7</sup> ) = 2.93 × 10 <sup>-3</sup> m = 2.93 mm	M1 A0	[1]
	<b>(ii)</b>	$\Delta R = \rho \Delta L / A$ = (2.6 × 10 <sup>-8</sup> × 2.93 × 10 <sup>-3</sup> ) / (3.8 × 10 <sup>-7</sup> )	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>(b)</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 <sup>3</sup> ) = <i>n</i> × 590 × 10 <sup>-9</sup>	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]
	<b>(ii)</b> (	0.5 kW	A1	[1]
		otal resistance = 3 <i>R</i> / 2 power = 0.67 kW	C1 A1	[2]

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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]