

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Subsidiary and Advanced Level

MARK SCHEME for the October/November 2015 series

9702 PHYSICS

9702/22

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

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1 (a)
$$v = f\lambda$$

$$\lambda = (3.0 \times 10^8)/(4.6 \times 10^{20})$$

C1

$$(=6.52 \times 10^{-13} =) 0.65(2) pm$$

(b)
$$t = (8.5 \times 10^{16})/(3.0 \times 10^8)$$

$$(= 2.83 \times 10^8 =) 0.28(3) Gs$$

(c) mass, power and temperature all underlined and no others

B1 [1]

B1 [1]

C1

e.g. $[14^2 + 8.0^2 - 2(14)(8.0) \cos 60^\circ]^{1/2}$ **or** $[(14 - 8.0 \cos 60^{\circ})^{2} + (8.0 \sin 60^{\circ})^{2}]^{1/2}$

resultant velocity = 12(.2) (or 12.0 to 12.4 from scale diagram) m s⁻¹

[2] **A1**

2 (a) (i)
$$v = u + at$$

$$0 = 3.6 - 3.0t$$

$$t = 3.6/3.0 = 1.2s$$

Α1 [2]

(ii) (distance to rest from P =
$$(3.6 \times 1.2)/2 = 2.2 (2.16)$$
 m

A1 [1]

$$[0 - (3.6)^2]/[2 \times (-3.0)] = 2.2 (2.16) m$$

$$3.6 \times 1.2 - \frac{1}{2} \times 3.0 \times (1.2)^2 = 2.2 (2.16) \text{ m}$$

$$0 + \frac{1}{2} \times 3.0 \times (1.2)^2 = 2.2 (2.16) \text{ m}$$

C1

(b) distance = 6.0 - 2.16 (= 3.84)

$$v^2 = u^2 + 2as = 2 \times 3.0 \times 3.84 (= 23.04)$$

M1

or

$$x + 2 \times 2.16 = 6.0$$
 gives $x = 1.68$ (m)

(C1)

$$v^2 = 3.6^2 + 2 \times 1.68 \times 3.0 (= 23.04)$$

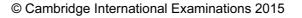
(M1)

or correct method with intermediate time calculated (t = 1.6 s from Q to R)

$$v = 4.8 \,\mathrm{m \, s^{-1}}$$

A0 [2]

Pa	age 3		Mark Scheme	Syllabus	Paper	PLATINUM BUSINESS ACADEMY
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	(c) :	straight line from	$v = 3.6 \text{ m s}^{-1} \text{ to } v = 0 \text{ at } t = 1.2 \text{ s}$		B1	
	;	straight line cont	inues with the same gradient as v changes sign		B1	
	;	straight line from	$v = 0$ intercept to $v = -4.8 \mathrm{m s^{-1}}$		B1	[3]
	(d) (difference in KE	= $\frac{1}{2}m(v^2 - u^2)$ = $0.5 \times 0.45 (4.8^2 - 3.6^2)$ [= $5.184 - 2.916$]		C1	
			= 2.3 (2.27) J		A1	[2]
3	(a)	(i) $k = F/x$ or 1	/gradient		C1	
		(k = 4.4/(5.4))	4×10^{-2}) =) 81 (81.48) N m ⁻¹		A1	[2]
	(ii) work done =	area under line or ½Fx or ½kx²		C1	
		(=	$0.5 \times 4.4 \times 5.4 \times 10^{-2} =) 0.12 (0.119) J$		A1	[2]
	(b)		gy/E_k of trolley/T (and block) changes to EPE/strain tic energy of spring		B1	
		EPE change	es to KE <u>of trolley/T</u> and KE <u>of block</u> or to give <u>lower</u> k	E to trolley	B1	[2]
	(ii) change in m	nomentum = m(v + u)		C1	
			= 0.25 (0.75 + 1.2) = 0.49 (0.488) Ns		A1	[2]
4	(a)	product of the fo	rce and the perpendicular distance to/from a point/piv	ot	B1	[1]
	(b)	· ,	$< \sin 30^{\circ}$ or $500 \times 1.4 \times \sin 30^{\circ}$ or $T \times 2.8$ 4 or 500×0.7		B1	
			$x \sin 30^{\circ} + 500 \times 1.4 \times \sin 30^{\circ} = T \times 2.8$ 100 (2125) N		M1 A0	[2]
	(ii) $(T_v = 2100 \text{ c})$	os 60° =) 1100 (1050)N		A1	[1]



upward force at A + T_v = sum of downward forces/weight+load/4500 N

(iii) there is an upward (vertical component of) force at A



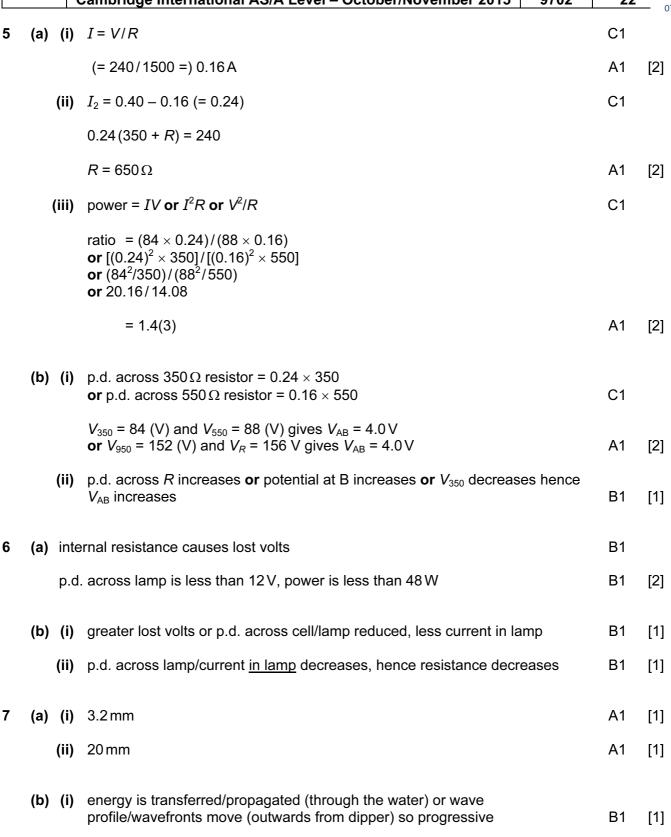
В1

В1

[2]

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5 (a) (i	I = V/R		C1	07778380





(ii) to produce waves with constant/zero phase difference/coherent waves

B1

[1]

P	age 5	5	Mark Scheme	Syllabus	Pape	r PLATINUM
		(Cambridge International AS/A Level – October/November 2015	9702	22	0777898626
	(c)	(i)	path difference is λ		B1	0777836020
			water vibrates/oscillates with amplitude about $2\times3.2\text{mm}$		B1	[2]
		(ii)	path difference is $\lambda/2$ so little/no motion/displacement/amplitude		B1	[1]
8	(a)		ult: majority/most (of the α -particles) went <code>straight</code> through/were devall angles	viated by	M1	
			nclusion: <u>most</u> of the atom is (empty) space or size/volume of nucleuall <u>compared with atom</u>	ıs <u>very</u>	A1	
			ult: a small proportion were deflected through large angles or >90° o aight back	or came	M1	
			nclusion: the mass or majority of mass is in a (very) small charged ume/region/nucleus		A1	[4]
	(b)	ρ=	m/V		C1	
			ss of atom and mass of nucleus (approx.) equal stated \textbf{or} cancelled en e.g. $63u$ or $63\times1.66\times10^{-27}$	or values	C1	
		rati or	o = $(r_A)^3/(r_N)^3$ = $(1.15 \times 10^{-10})^3/(1.4 \times 10^{-14})^3$			
			o = $(d_A)^3/(d_N)^3$ = $(2.3 \times 10^{-10})^3/(2.8 \times 10^{-14})^3$ = 5.5×10^{11}		A1	[3]