## UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

## MARK SCHEME for the May/June 2012 question paper for the guidance of teachers

## 9702 PHYSICS

9702/22

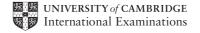
Paper 2 (AS Structured Questions), maximum raw mark 60

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1 (a) 
$$\frac{V}{t} = \frac{\pi P r^4}{8 C l}$$
  
 $C = [\pi \times 2.5 \times 10^3 \times (0.75 \times 10^{-3})^4] / (8 \times 1.2 \times 10^{-6} \times 0.25)$  C1  
 $= 1.04 \times 10^{-3} \text{ N s m}^{-2}$  A1 [2]

(b) 
$$4 \times \%r$$
 C1  
 $\%C = \%P + 4 \times \%r + \%V/t + \%l$   
 $= 2\% + 5.3\% + 0.83\% + 0.4\% (= 8.6\%)$  A1  
 $\Delta C = \pm 0.089 \times 10^{-3} \text{ N s m}^{-2}$  A1 [3]

(c) 
$$C = (1.04 \pm 0.09) \times 10^{-3} \text{ N s m}^{-2}$$
 A1 [1]

2 (a) (i) 
$$v^2 = u^2 + 2as$$
  
=  $(8.4)^2 + 2 \times 9.81 \times 5$   
=  $12.99 \text{ m s}^{-1}$  (allow 13 to 2 s.f. but not 12.9) C1

(ii) 
$$t = (v - u) / a$$
 or  $s = ut + \frac{1}{2}at^2$   
=  $(12.99 - 8.4) / 9.81$  or  $5 = 8.4t + \frac{1}{2} \times 9.81t^2$  M1  
 $t = 0.468$  s

(c) (i) 1. kinetic energy at end is zero so 
$$\Delta KE = \frac{1}{2} mv^2$$
 or  $\Delta KE = \frac{1}{2} mu^2 - \frac{1}{2} mv^2$  C1 =  $\frac{1}{2} \times 0.05 \times (8.4)^2$  = (-) 1.8 J A1 [2]

2. final maximum height = 
$$(4.2)^2 / (2 \times 9.8) = (0.9 \text{ (m)})$$
  
change in PE =  $mgh_2 - mgh_1$  C1  
=  $0.05 \times 9.8 \times (0.9 - 5)$  C1  
=  $(-) 2.0 \text{ J}$  A1 [3]

- 3 (a) A body continues at rest or constant velocity unless acted on by a resultant (external) forceB1 [1]
  - (b) (i) constant velocity/zero acceleration and therefore no resultant force M1 no resultant force (and no resultant torque) hence in equilibrium A1 [2]

(ii) component of weight = 
$$450 \times 9.81 \times \sin 12^{\circ} (= 917.8)$$
 C1  
tension =  $650 + 450 g \sin 12^{\circ} = (650 + 917.8)$  C1  
=  $1600 (1570) N$  A1 [3]

	Page 3	Mark Scheme: Teachers' version Syllabus	Pape	er
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		rk done against frictional force or friction between log and slope tout power greater than the gain in PE / s	M1 A1	[2]
4	current	sistance = 20 (k $\Omega$ ) = 12 / 20 (mA) or potential divider formula 12 / 20] × 12 = 7.2 V	C1 C1 A1	[3]
	total res	resistance = 3 (k $\Omega$ ) sistance 8 + 3 = 11 (k $\Omega$ ) = 12 / 11 × 10 <sup>3</sup> = 1.09 × 10 <sup>-3</sup> or 1.1 × 10 <sup>-3</sup> A	C1 C1 A1	[3]
	` ' ` '	R resistance decreases al resistance (of circuit) is less hence current increases	M1 A1	[2]
	` '	sistance across XY is less s proportion of 12 V across XY hence p.d. is less	M1 A1	[2]
5	(a) E = stre	ess / strain	B1	[1]
	` , `,	diameter / cross sectional area / radius original length	B1	[1]
	me	easure original length with a <u>metre</u> ruler / tape easure the <u>diameter</u> with micrometer (screw gauge) ow digital vernier calipers	B1 B1	[2]
	(iii) end	ergy = $\frac{1}{2}$ Fe or area under graph or $\frac{1}{2}$ $kx^2$ = $\frac{1}{2}$ × 0.25 × 10 <sup>-3</sup> × 3 = 3.8 × 10 <sup>-4</sup> J	C1 A1	[2]
		line through origin below original line ough (0.25, 1.5)	M1 A1	[2]
6	` same fr	ves travelling (along the same line) in opposite directions overlap/medequency / wavelength nt displacement is the sum of displacements of each wave /	et M1 A1	
		es nodes and antinodes	B1	[3]
	adjustn	tus: source of sound + detector + reflection system nent to apparatus to set up standing waves – how recognised rements made to obtain wavelength	B1 B1 B1	[3]
	(c) (i) at l	east two nodes and two antinodes	A1	[1]
	c =	de to node = $\lambda$ / 2 = 34 cm (allow 33 to 35 cm) = $f\lambda$ 340 / 0.68 = 500 (490 to 520) Hz	C1 C1 A1	[3]

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7	(a)	W = 1 ar Y = 2 Z = 55	nd X = 0		A1 A1 A1	[1] [1] [1]
	(b)	(b) explanation in terms of mass – energy conservation energy released as gamma or photons or kinetic energy of products or em radiation		roducts or	B1	
				B1	[2]	